DISSERTATION ON

A STUDY ON THE RISK FACTORS FOR RECURRENCE OF FEBRILE SEIZURES IN CHILDREN ADMITTED IN A TERTIARY CARE HOSPITAL

Dissertation submitted to

THE TAMILNADU DR. M. G. R. MEDICAL UNIVERSITY

In partial fulfillment of the regulations

for the award of the degree of

M.D. DEGREE IN PEDIATRIC MEDICINE

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CERTIFICATE

This is to certify that the Dissertation entitled **"A STUDY ON THE RISK FACTORS FOR RECURRENCE OF FEBRILE SEIZURES IN CHILDREN ADMITTED IN A TERTIARY CARE HOSPITAL"** is a bonafide record of work done by **Dr. M. EDWIN RAJA,** in the Department of Pediatrics, Government Theni Medical College, Theni, during his Post Graduate Course from 2016 to 2019. This is submitted as partial fulfillment for the requirement of **M.D.,** Degree examinations – Branch- VII(Pediatrics) to be held in May 2019.

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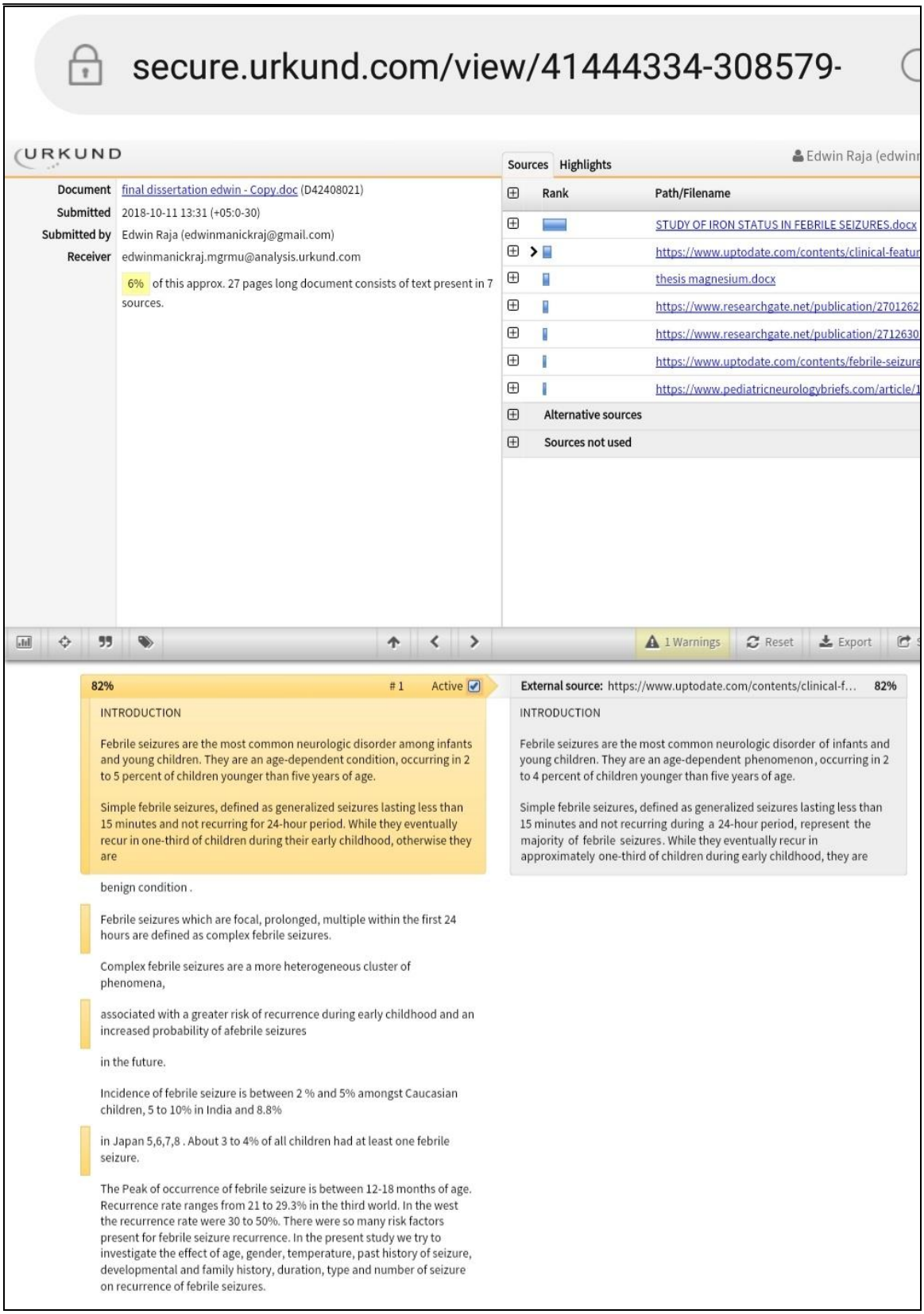
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INTRODUCTION
Febrile seizures are the most common neurologic disorder among infants and young children. They are an age-dependent condition, occurring in 2 to 5 percent of children younger than five years of age.
Simple febrile seizures, defined as generalized seizures lasting less than 15 minutes and not recurring for 24-hour period. While they eventually recur in one-third of children during their early childhood, otherwise they are
benign condition .
Febrile seizures which are focal, prolonged, multiple within the first 24 hours are defined as complex febrile seizures.
Complex febrile seizures are a more heterogeneous cluster of phenomena,
associated with a greater risk of recurrence during early childhood and an increased probability of afebrile seizures
in the future.
Incidence of febrile seizure is between 2 % and 5% amongst Caucasian children, 5 to 10% in India and 8.8%
in Japan 5,6,7,8 . About 3 to 4% of all children had at least one febrile seizure.
The Peak of occurrence of febrile seizure is between 12-18 months of age. Recurrence rate ranges from 21 to 29.3% in the third world. In the west the recurrence rate were 30 to 50%. There were so many risk factors present for febrile seizure recurrence. In the present study we try to investigate the effect of age, gender, temperature, past history of seizure, developmental and family history, duration, type and number of seizure on recurrence of febrile seizures.
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DECLARATION

I, Dr. M. EDWIN RAJA, solemnly declare that the Dissertation titled **"A STUDY ON THE RISK FACTORS FOR RECURRENCE OF FEBRILE SEIZURES IN CHILDREN ADMITTED IN A TERTIARY CARE HOSPITAL"** is a bonafide work done by me in the Department of Pediatrics, Government Theni Medical College Hospital, Theni, during the period July 2017 – June 2018.

The Dissertation is submitted to **"The Tamilnadu Dr. M.G.R. Medical university, Chennai**, **Tamilnadu"** as a part of fulfillment for the requirement of **M.D**.Degree examinations-Branch-VII (Pediatrics) to be held in May 2019.

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ABBREVIATIONS

CNS – Central nervous system

CSF – Cerebrospinal fluid

CSOM – Chronic suppurative otitis media

CT – Computed tomography

EEG – Electroencephalography

FS – Febrile seizure

FSE – Febrile status epileptics

GABA – Gamma-amino butyric acid

GEFS+ – Generalized epilepsy with febrile seizures plus

GTCS – Generalized tonic clonic seizure

Hb - Hemoglobin

HHV – Human herpes virus

HSV – Herpes simplex virus

ICP – Increased intracranial pressure

IDA – Iron deficiency anaemia

IL – Interleukins

IQ – Intelligence quotient

LP – Lumbar puncture

MCH – Mean corpuscular hemoglobin

MCV – Mean corpuscular volume

MMR – Measles mumps rubella

MRI – Magnetic resonance imaging

MTS – Mesial temporal sclerosis

RBS – Random blood sugar

RNA – Ribonucleic acid

RFT – Renal function test

SCN – Sodium channel

TNF – Tumor necrosis factor

TLE – Temporal lobe epilepsy

CONTENTS

INTRODUCTION

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Simple febrile seizures, defined as generalized seizures lasting less than 15 minutes and not recurring for 24-hour period. While they eventually recur in one-third of children during their early childhood, otherwise they are benign condition . Febrile seizures which are focal, prolonged, multiple within the first 24 hours are defined as complex febrile seizures. Complex febrile seizures are a more heterogeneous cluster of phenomena, associated with a greater risk of recurrence during early childhood and an increased probability of afebrile seizures in the future.

Incidence of febrile seizure is between 2 % and 5% amongst Caucasian children, 5 to 10% in India and 8.8% in Japan [5,6,7,8] . About 3 to 4% of all children had at least one febrile seizure. The Peak of occurrence of febrile seizure is between 12-18 months of age. Recurrence rate ranges from 21 to 29.3% in the third world. In the west the recurrence rate were 30 to 50%. There were so many risk factors present for febrile seizure recurrence. In the present study we try to investigate the effect of age, gender, temperature, past history of seizure, developmental and family history, duration, type and number of seizure on recurrence of febrile seizures.

Definitions:

Seizure:

It is defined as a transient occurrence of symptoms and signs due to abnormal excessive or synchronous neuronal activity in the brain.

Febrile seizure:

It is defined as seizure, which

- occur in children between the age of 6 months to 60 months with the temperature of 100.4° F (38° C),
- are not due to central nervous system infection or any metabolic disturbance,
- occur in the absence of history of previous afebrile seizures. [1]

Febrile status epilepticus:

It is a febrile seizure lasting more than 30 minutes. It is the most common type of status epilepticus in children.

Simple febrile seizure plus:

It is defined as recurrent simple febrile seizures within 24 hours by some authors.

Classification: [2]

Febrile seizures can be further divided into two categories, based on its clinical features .

1. Simple febrile seizure
2. Complex febrile seizure

Simple febrile seizure:

It is defined as a primary generalized tonic clonic seizure associated with fever, which is lasting for a maximum of 15 minutes and not recur within a 24 hour period. Simple febrile seizures are the commonest type of febrile seizures. As majority of the simple febrile seizures lasts for less than five minutes, a maximum limit of 10 minutes has been proposed as a more suitable threshold for distinguishing between simple and complex .[3]

Complex febrile seizure:

It is defined as a seizure which is prolonged more than 15 minutes, is a focal seizure and / or recurs within 24 hour .[4]

Epidemiology:

- Incidence of febrile seizure is between 2 % and 5% amongst Caucasian children and 8% amongst Japanese children. [5,6,7,8]
- The Peak of occurrence of febrile seizure is between 12-18 months of age. [9,10]

- There is a slight male predominance, with an estimated male to female ratio is 1.6:1 [11]
- Simple febrile seizure accounts for two thirds of the entire group of febrile seizure. [10,12]

Etiology :

Table 1 : Causes and factors associated with febrile seizure: [13]

Infections:	Others:
Viruses: Respiratory • Influenza virus A and B • Parainfluenza 1, 2, and 3 • Respiratory syncytial virus • Adenovirus Enteric • Entero viruses • Enterovirus 71 • Coxsackieviruses group A • Rotavirus • Herpesviruses • Human herpesvirus-6 and -7	Familial: • Genetics • Environmental Channelopathies: • Sodium, potassium, and calcium channels • GABA-A Vaccination: • Measles Mumps Rubella (MMR) • Pertussis Structural brain defects & perinatal events: • Cerebral palsy (neurodevelopmental disabilities)

• Cytomegalovirus • Herpes simplex virus-1 Bacteria: • Escherichia coli (urine) • Shigella dysenteriae (enteric) • Streptococcus pneumoniae (upper respiratory) • Salmonella enteritidis (enteric)	• Cerebral dysgenesis • Neonatal brain injury (low Apgar scores; prematurity) • Strokes • Vascular malformations • Tumors pH: • Acidosis • Alkalosis • Water, electrolyte imbalance: Sodium, potassium, chloride, magnesium, calcium • Cytokines.

Infections:

Viral and bacterial infections are the most predominant causative factors of febrile seizures [14].

Influenza A and B:

Influenza A virus infection is a predominant cause of febrile seizures, especially in Asian countries. It is usually associated with a higher number of FS cases than any other

respiratory virus, such as parainfluenza virus or adeno virus. Rapid diagnostic tests for viral infections (eg, influenza A) seems more cost-effective and practical in the management of complex febrile seizures. Effective vaccination may help to prevent the occurrence of FS, especially in the patients with a previous history of FS [14].

Respiratory Syncytial Virus :

Neurological complications, such as encephalopathy with seizures and hypotonia or encephalopathy presenting as seizures, have been associated with respiratory syncytial virus infections [15].

Enterovirus :

Enteroviruses have also been one of the causative factors of seizures. Central nervous system “cytokine storm” can occur in patients with enterovirus-71 infection. The causative agent of fever associated with seizures during summer are predominantly enteroviruses, specifically coxsackievirus group A. [16].

Rotavirus :

Rotavirus, which accounts for the most common cause of diarrhea in children, primarily affects infants and children from 3months to 2years of age. A seizure presenting before the onset of diarrhea has been reported in 40% of the patients. The loss of water and electrolytes in rotavirus, diarrhea may also be concerned with the evolution of the accompanying seizure [14].

Herpesviruses :

Members of the herpes virus family possess neurotropism and can cause neurologic disorders in children: HSV-1, HSV-2, varicella zoster virus, Epstein-Barr virus,

cytomegalovirus, HHV-6, and HHV-7. Of these, HSV-1, cytomegalovirus, HHV-6, and HHV-7 have been known to cause febrile seizures [14].

Bacteria

Compared to viral infections, bacteremia is an infrequent cause of febrile seizures. Childhood illnesses with Shigella dysenteriae(enteritis), Salmonella enteritidis (enteritis), Escherichia coli (urinary tract infection) and Streptococcus pneumoniae (respiratory tract infection) are commonly associated with febrile seizures[14].

Familial:

Genetics and Environmental

Genetic risk factors have significantly contributed to the causation of febrile seizures. It tends to occur in families and a first degree relative (parent or sibling) having a history of febrile seizures is one of the primary risk factor. It has been reported that around 10-20% of siblings with febrile seizures have a risk of developing febrile seizures. The chances for development of febrile seizures amongst children are higher if one of the parents had history of febrile seizures [17].

Channelopathies

Mutations of the genes encoding various channels (SCN1B, SCN1A, and SCN2A for sodium channel; and GABRG2 for GABA-A receptor)

Table 2 : The different mutation and their clinical correlations: [18]

Mutation	Chromosome	Clinical syndrome	Comments
FEB1	8q13-q21	Febrile seizure	
FEB2	19p13.3	Febrile seizure	
FEB4	5q14-q15	Febrile seizure	The most common linkage locus in febrile convulsion families
SCN1B	19p13.1	Generalized epilepsy with febrile convulsion plus (GEFS+)	Mutation in the voltage-gated sodium channel ß 1 subunit gene
SCN1A	2q24	Simple febrile convulsion	Mutation in α 1 subunit gene
AKAP18	6q22-q24	Simple febrile convulsion	
GABRG2gene, encoding the GABA(A)receptor gamma 2 subunit		Febrile convulsion either with or without absence epilepsy	
1 beta (-511)		Increase frequency	IL-1ß polymorphism of febrile convulsion

Vaccination

Fever is the most anticipated side effect of immunizations. Both febrile and afebrile seizures have been associated with vaccinations [19]. They are most likely to occur after the administration of certain live attenuated vaccines such as the mumps, measles, rubella (MMR) vaccine, and toxin-containing or whole cell preparations, such as whole cell pertussis vaccines [19]. The substitution of whole cell pertussis vaccines with acellular vaccines has brought down the incidence of adverse effects following pertussis vaccination to approximately 1/3rd of whole cell preparations [20].

Structural Brain Defects and Perinatal Events

Neonatal and perinatal brain insults, low Apgar scores at 5 minutes of life, cerebral palsies, cerebral dysgenesis, strokes, vascular malformations and tumors have been known to cause febrile seizures. Premature birth, delayed discharge from the NICU and developmental delay are potential markers for suboptimal brain functioning[19].

pH (Acidosis and Alkalosis)

A rise in brain pH enhances neuronal excitability. The duration of the alkaline cortical pH shift after injection of bicarbonate and the associated seizure activity are more brief (< 5 minutes) than those observed along with hyperthermia but are otherwise considered similar [22].

Water and Electrolyte Imbalance

In 1953, Lennox suggested the mechanism of febrile seizures that which is possibly associated with the importance of hydration and increased permeability of cell membranes [23]. An elevation of the "threshold" to febrile seizures which occurs with increasing age is associated with developmental changes in the balance of electrolytes especially hyponatremia and water. [14],[24]

Cytokines

Pyrogenic cytokines such as IL-1ß are involved in the pathogenesis of febrile seizures. A common viral component which promotes host cell immune responses is ds RNA. Significantly greater levels of IL-1ß production from ds RNA-stimulated leukocytes in febrile seizure patients in the absence of infection have been observed and it suggests that the response of leukocytes to viral infection might be enhanced in patients who had febrile seizures. Research during the past two decades has indicated that both astrocytes and microglia secrete numerous cytokines, such as IL-1ß, TNFα, IL-6 [25].

Serum and CSF zinc levels are shown to reduce in children with febrile seizures, and zinc deprivation may play a pivotal role in the pathogenesis of febrile seizure [26]. IDA is found to be commoner in children with febrile seizure than controls and may also be related to the pathogenesis of FS [18]. A possible immunological derangement in the cytokines and interferon axis in FS may correlate with the pathogenesis of FS or of the fever [27].

Risk factors for first febrile seizure:

Four factors are associated with a greater risk of first febrile seizures in the childhood population[28]:

- First- or second- degree relative with a history of febrile seizures
- Neonatal nursery stay of >30 days
- Developmental delay
- Attendance at day care

There is 28% chance of occurrence of at least one episode of febrile seizure for children with any of the two of these factors[28].

Significant independent risk factors [29]:

1. Peak of the temperature
2. History of febrile seizures in a first- or second-degree relative

Gastroenteritis have a significant inverse (i.e., protective) association with febrile seizures.

Recurrent Febrile Seizures:

Febrile seizure recur 30% of children after the first episode, 50% after two or more episodes and 50% of infants less than one year old. [29]. Half of recurrences occur within six months following the first episode, 3/4th of recurrences within 1 year and 90% occur within 2 years of first episode. [29,30] There is no affirmation that febrile seizures or febrile

status epilepticus can lead to cerebral palsy, neurologic damage, mental retardation, decrease in IQ and learning problems [31].

Approximately 1/3rd of children with a first episode of febrile seizure will have an episode of recurrence; 10% will have 3 or more episodes of febrile seizures. The most cardinal risk factors are family history of FS and onset of first febrile seizure at less than 12 months of age [9]. Two other definitive risk factors for recurrence of FS are height of the temperature and the time interval between the onset of fever and the episode of seizure [29-31,32].

In general, if the temperature is very high, the chance of recurrence is low. In one study, those with a temperature of 101°F had 42% risk for recurrence at 1 year, 29% risk for those with a temperature of 103°F, and only 12% risk for those with a temperature of 105°F [29,30,32].

Second, if the extent of recognized fever is short, the chance of recurrence is high. The recurrence risk at 1 year is 46% for those with a FS within one hour of recognized onset of fever, compared with 25% risk for those having fever lasting for 1 to 24 hours, and 15% risk for those having >24 hours of recognized fever prior to the event of febrile seizure.

Table 3 : Risk factors for recurrence of febrile seizure: 33

Major:
Age < 1 year Duration of fever < 24 hour Fever 100.4 –102.2° F (38-39° C)
Minor:
Family history of febrile seizure Family history of epilepsy Complex febrile seizure Day care Male gender Low serum sodium at the time of presentation

Table 4 Recurrence risk

Risk factors	Recurrence risk (%)
0	12
1	25-50
2	50-59
≥3	73-100

A recurrent febrile seizure is more likely to be prolonged if the first episode was a prolonged episode. The correlation between the overall risk of recurrent febrile seizure and a family history of unprovoked seizures appears to be uncertain. A large study in Rochester, Minnesota, found out that there exists no difference in risk for recurrence of FS in a child with a family history of epilepsy (25%) and those without such family history (23%). [31]

Subsequent epilepsy:

The major concern for parents of a child with febrile seizures is the challenge of an increased risk of epilepsy . 15% of children having epilepsy may be experienced febrile seizures. But, only 2% to 7% of children having febrile seizures may develop epilepsy in his or her adolescence or adulthood [33].

The risk for epilepsy in the general population is around 0.5%, whereas the risk for epilepsy in children having prolonged FS is approximately 1.5%. But at the same time, children having febrile seizures may have a three fold increase in risk of developing epilepsy [17]. Data obtained from five large cohort studies considering children with FS suggest that 2-10% of children having febrile seizures will develop epilepsy [14,35]. Family history of epilepsy and complex febrile seizure are associated with an increased risk of subsequent epilepsy [14,19,35]

Children developing febrile seizure within one hour of the onset of recognized fever have a greater risk for developing subsequent epilepsy than those children having febrile seizure associated with longer fever duration [19]. A candidate with febrile status epilepticus will have more risk for subsequent epilepsy than a complex febrile seizure that is less prolonged [19,35].

Table 5 : Risk factor for subsequent epilepsy after a febrile seizure: 33

Risk factor	Risk for subsequent epilepsy (%)
Simple febrile seizure	1
Recurrent febrile seizure	4
Complex febrile seizure	6
Fever < 1hr before febrile seizure	11
Family history of epilepsy	18
Complex febrile seizure (focal)	29
Neurodevelopmental abnormalities	33

The number of complex features in a FS may influence the chances of recurrence. One study presented that patients with 2 complex features of FS had a greater risk of developing subsequent epilepsy [35]. Age at first febrile seizure, the height of fever at first seizure and family history of febrile seizures are not concerned with increased risk of developing epilepsy [14,19,35].

The risk factor for both recurrent FS and subsequent epilepsy is the duration of fever prior to the episode of FS and this can be a predictable marker for overall seizure susceptibility. The variants of epilepsy that develop in children with febrile seizures are diverse and they are almost similar to the types of epilepsy that develop in children without febrile seizures [36].

Febrile seizures may present as the first manifestation of specific epilepsy syndromes, such as severe myoclonic epilepsy of infancy[9]. First, there is no evidence of a higher incidence of epilepsy in populations with a higher incidence of FS (eg, 10% in Tokyo, Japan) [13]. Second, the treatment of febrile seizures does not alter the course of subsequent epilepsy [7,9].

Febrile Seizure and Temporal Lobe Epilepsy(TLE):

As many as 40% of adult patients with intractable temporal lobe epilepsy may have a history of complex (specifically prolonged) febrile seizures in childhood[37].A recent study by Trinka and colleagues found that there was strong association between complex febrile seizures and the subsequent development of TLE [38].

A particular study in which, MRI was used as a research tool,was conducted within 2 days of a complex febrile seizures showed evidence of hippocampal edema . Serial follow up imaging within one year in these patients showed resolution of the

hippocampal edema and did not show any hippocampal atrophy or mesial temporal sclerosis (MTS) in the previously swollen temporal lobes [20].

Early histopathological reports were suggestive of a possible causal relationship between prolonged childhood febrile seizures and MTS [40]. But,more recently neuropathological data from 33 children with refractory TLE, with and without a history of preceding risk factors for TLE, showed cortical dysplasia in 21 patients (66%), including 73% of patients (11/15) with a history of FS. Finally, animal data support the hypothesis that, complex FS may enhance hippocampal excitability [41].

Current results support an association between complex febrile seizures and pre-existing lesions within the temporal lobe and this may subsequently facilitate the development of hippocampal atrophy. In addition, the contradictory findings obtained from epidemiological, pathological and neuroimaging studies would also suggest that the association of complex febrile seizure with hippocampal atrophy and temporal lobe epilepsy reflects complex interactions between genetic and environmental factors , which may subsequently facilitate the development of temporal lobe epilepsy. This increased susceptibility is likely to be multifactorial but may involve cytokines, specifically IL-1 [42].

Clinical features:

Presentation:

Febrile seizures occur in infants and children between the age group of 6 months and 5 years, with the greater part appearing in children between 12 to 18 months of age. Febrile seizures have been reported in children over six years of age, but in older children, febrile seizures should be considered as a diagnosis of exclusion, as they are more possible than younger children with febrile seizures to have subsequent afebrile seizures [43].

The majority of children may encounter their febrile seizures on the first day of illness, and in some cases, it is the first manifestation of that child being ill. The degree of fever associated with febrile seizures is variable and is dependent on the child's threshold convulsive temperature. While the most commonly measured fever is often at or above 39ºC, approximately 25 percent of events occur when the temperature is between 38ºC and 39ºC. [44]

Seizure characteristics

Simple febrile seizures :

Simple febrile seizures are generalized, lasts for less than 15 minutes, and do not recur in 24-hour period. The most common presentation is generalized tonic clonic, but atonic and tonic spells can also present. The facial and respiratory muscles are commonly involved. Although by definition the extent of a simple febrile seizure can be as long as

15 minutes, most simple febrile seizures get terminated much sooner, with a median duration of three to four minutes [3].

Children typically return to baseline quickly after an episode of simple febrile seizure. As with non-febrile seizures, the postictal phase can present with confusion or agitation and drowsiness. Prolonged drowsiness is not classical of a simple febrile seizure and should consider an alternative etiology like meningitis, structural brain pathology . Similarly, the presence of persistently open and deviated eyes is an important clinical feature signifying ongoing seizure activity.

Complex febrile seizures:

Complex febrile seizures (focal onset, prolonged, or recurrent within 24 hours) occur less frequently, making up for roughly 20 percent of febrile seizures in most cases. Prolonged seizures present in lesser than 10 % and focal features in fewer than 5 % of children with febrile seizures. One episode of simple febrile seizure may be consecutively followed by complex seizures, but a larger part of them who develop complex febrile seizures do so with their first seizure. However, an initial complex febrile seizure does not indicate that all subsequent seizures will be complex. A momentary episode of hemiparesis following a febrile seizure (Todd's paresis), usually of complex or focal type, is rare, which is seen in 0.4 to 2 percent of cases [11,45].

Children presenting with complex febrile seizures are often younger and are more likely to have an atypical and abnormal development pattern. In one study of 158 children with a first febrile seizure, prolonged seizures (>10 minutes) occurred in 18 percent were associated with developmental delay and younger age at first seizure [3].

Febrile status epilepticus:

Some patients experienced febrile status epilepticus (FSE), ie, continuous seizures or intermittent seizures without neurological recovery, lasting for 30 minutes or longer. One-third of cases of FSE, the actual seizure duration is underestimated in the emergency department [46]. Important clinical clues that a seizure has ended include the presence of closed eyes and a deep breath.

A multicenter prospective cohort study (FEBSTAT) described the characteristics of prolonged (>30 minutes) febrile seizures in 119 children, aged one month through five years, as follows [46]:

- The median duration was 68 minutes
- The seizures were convulsive in all but one child
- The seizures were continuous in 52 percent and intermittent in 48 percent
- Two-thirds of seizures were partial
- This was the first febrile seizure in 76 percent of children
- Primary or reactivated human herpesvirus 6B (HHV-6B) infection was found in 32 percent of children

In the FEBSTAT cohort, the median peak temperature of onset was 103ºF (39.4ºC), most patients presented with a defined viral or bacterial infection, and there was higher-than-expected family history of epilepsy [46].

Differential diagnosis:

The differential diagnosis of febrile seizure includes nonepileptic events or movements, provoked seizures following a central nervous system infection and rare forms of genetic epilepsy in which seizures typically present with fever.

Shaking chills:

Involuntary movements in a sick child can be misinterpreted as seizures. Shaking chills can be usually readily distinguished from seizures. Chills are typical of high grade fever and are characterized by fine rhythmic oscillatory movements. They infrequently involve facial or respiratory muscles, which habitually occur during febrile seizures.

In addition, chills typically involves the body bilaterally and are seldom associated with loss of consciousness . Thus, bilateral manifestations without apparent unconsciousness are strongly suggestive that the activities are non-epileptic. Any repetitive movements must be evaluated by touch, since seizures should not be suppressible by touch.

Central nervous system infection:

Provoked seizures due to meningitis or encephalitis are the main consternation in a child presenting with fever and seizures. In 40 % of younger infants, who have seizures

as an initial presentation of meningitis do not show any meningeal signs, they have other symptoms and manifestations like altered consciousness, petechial rash that are strongly suggestive of the accurate diagnosis [49].

It is exceedingly rare for bacterial meningitis to be diagnosed purely on the basis of doing a "routine" evaluation of the cerebrospinal fluid (CSF) following a simple febrile seizure. When the sole indication for performing a lumbar puncture is the seizure, meningitis will be found in less than 1 percent of patients and less than one-half of these may present as bacterial meningitis [50,51].

Meningitis itself is becoming increasingly sporadic following the practice of widespread Streptococcus pneumoniae and Haemophilus influenzae type b immunization practices. Children presenting with status epilepticus and fever are more likely to have bacterial meningitis than those with a transient seizure. Bacterial meningitis itself has become infrequent with universal vaccination. [52,47]

Genetic epilepsies with febrile seizures:

In certain patients, the febrile seizures are the early manifestation of generalized epilepsy with febrile seizures plus (GEFS+), a genetic epilepsy for which a myriad of causative mutations have been identified. The most common phenotype of GEFS+ consists of children who had seizures with fever in early childhood that, unlike typical

febrile seizures, carry on beyond six years of age or are presenting with afebrile tonic-clonic seizures as well as other seizure types [53, 54].

GEFS+ is commonly linked with an autosomal dominant inheritance pattern. SCN1B, the gene encoding the sodium channel beta 1 subunit, was the first gene identified for GEFS+. Additional families have been discovered with mutations in genes encoding voltage-gated sodium, calcium, and potassium channels; ligand-gated ion channels; nicotinic cholinergic receptor; various subunits of the gamma-aminobutyric acid A receptor; and syntaxin 1B (STX1B) [18,55-66].

Severe myoclonic epilepsy of infancy (Dravet syndrome):

Dravet syndrome is an unusual genetic epilepsy that can resemble complex febrile seizures in the first year of life [68]. Patients with Dravet syndrome typically present in the first year of life with prolonged, often febrile, generalized clonic or hemiclonic seizures in the setting of normal cognitive and motor development prior to the onset of seizures. The most predictable precipitants for seizures in children with Dravet syndrome are fever/illness and vaccination [69].

Initial assessment:

The preliminary evaluation of children with seizure in the setting of fever must help in distinguishing febrile seizure from other significant and more serious etiologies such as

central nervous system infections. This can be accomplished by taking a complete history and thorough physical examination in most cases, along with neuroimaging and lumbar puncture in certain instances. Children presenting with focal or prolonged febrile seizures may require more extensive workup than those with simple febrile seizures, specifically at the time of the first seizure.

Diagnostic evaluation:

Febrile seizure is a clinical diagnosis, defined by the following features:

- A convulsion associated with an elevated temperature greater than 38°C
- A child older than three months and younger than six years of age
- Absence of central nervous system infection or inflammation
- Absence of acute systemic metabolic abnormality that may produce convulsions
- No history of previous afebrile seizures

Electroencephalography (EEG) and magnetic resonance imaging (MRI) in the outpatient setting may help further stratify outcome of future epilepsy in children with complex febrile seizures but are not usually necessary in an acute setting. The approach to outpatient evaluation of a child presenting with complex febrile seizures is not standardized, and a specific plan for each patient must be charted out by the treating physician, usually in consultation with a pediatric neurologist for interpretation of atypical and abnormal test results.

Children younger than 12 months of age also warrant special consideration since signs and symptoms of meningitis may be more subtle in this age group. The threshold for performing a lumbar puncture (LP) in these patients must be relaxed, particularly if immunization statuses for H. influenzae type b or Streptococcus pneumoniae are not up to date or cannot be verified.

History:

Key elements of the seizure history in a child presenting with a febrile seizure include seizure characteristics, duration of the seizure, and presence of focal features (eg, shaking limited to one limb or one side of the body). A witness to the seizure episode should be interviewed if possible, keeping in mind that seizures are frightening to many witnesses, and specific description of the seizure, including exact duration, may be difficult to elicit or at many times unreliable.

A careful history must guide us towards any underlying medical or neurologic conditions that further potentiate the child's risk of serious infections or underlying structural abnormality. The history must include an assessment of the child’s immunization status, personal or family history of seizure, and history of neurological conditions or developmental delay. A child with a known neurologic condition may be more likely to encounter a seizure with fever, which would not be classified as a simple febrile seizure.

Physical examination:

A general physical and neurologic examination should pay due attention to

- Vital signs
- Level of consciousness
- Presence or absence of meningismus
- Tense or bulging fontanelle
- Focal differences in muscle tone, strength
- Spontaneous movements.

The presence of any of these signs should immediately point towards an alternative etiology such as meningitis or an already underlying structural abnormality. Likewise, children with febrile seizures are usually well appearing, and post-ictal drowsiness typically resolves within five to ten minutes, based on the duration and type of seizure. Encephalopathy beyond this time period should prompt increased suspicion for possible central nervous system infection or severe systemic infection.

In a prospective cohort study done on more than 100 children presenting with febrile status epilepticus, the median seizure duration was 72 minutes, seizures were intermittent in half of the cases, and chart reviews suggested that status epilepticus was often went unrecognized by the emergency department staff [46,71].

Cardinal clinical clues that a seizure has ended include the presence of closed eyes and a deep breath. Children having persistently open and deviated eyes may still be seizing, although it may appear that the convulsive motor activity has stopped. In well-appearing children without an obvious source of infection, attention to abnormal vital signs and specific physical findings, including tachypnea or hypoxemia, lesions of the oropharynx, or a viral exanthem, may guide us towards a specific etiology, which is most often viral.

Lumbar puncture:

The necessity for a lumbar puncture (LP) and cerebrospinal fluid (CSF) examination to exclude meningitis or encephalitis in children presenting with febrile seizure is purely based on clinical signs. Approximately 25 percent of children with meningitis will have seizures at or before the initial presentation, but virtually all of them will have other signs and symptoms of meningitis [49].

Lumbar puncture is unnecessary in most well-appearing children who have returned to a normal range of activity after a febrile seizure . We agree with the American Academy of Pediatrics (AAP) recommendations regarding the performance of LP in the setting of febrile seizures, which include the following [72]:

- LP should be performed when there are meningeal signs or symptoms or other clinical features suggestive of a possible meningitis or intracranial infection

- LP should be considered in infants between 6 and 12 months if the immunization status for H. influenzae type b or Streptococcus pneumoniae is deficient or can't be determined.
- LP should be considered when the patient is on antibiotics since antibiotic therapy can mask the signs and symptoms of meningitis

LP should also be considered when febrile seizures presents after the second day of illness, based on history or examination, the clinician remains suspicious of a possible central nervous system infection. Based on case series, but not included in the AAP guidelines, febrile status epilepticus may be another possible indication for lumbar puncture [52,73].

Other laboratories :

A complete blood count and measurement of serum electrolytes [78], blood sugar, calcium, and urea nitrogen carries very low yield in patients with simple febrile seizures; these parameters may yield findings only when the patient has a history of vomiting, diarrhea, and abnormal fluid intake, or when physical findings of dehydration or Edema co-exist [72]. If a decision to perform an LP has been made, blood culture and serum glucose testing should be performed concurrently.

In children presenting with complex febrile seizures, hyponatremia is found to be common and has been concurrently associated with the potential for recurrent seizure

during the index illness. For this rationale, aggressive hydration with hypotonic fluids should generally be avoided in children with febrile seizures. Measurement of the serum sodium levels was considered a valuable investigation in the child with febrile seizure; the lower the serum sodium levels, the higher the likelihood of recurrence of seizure [79,80.]

Neuroimaging:

Neuroimaging with computed tomography (CT) or MRI is not an essential necessity for children with simple febrile seizures [72,81]. Urgent neuroimaging (CT with contrast or MRI) is mandated in children with abnormally large heads, a persistently abnormal neurologic examination, specifically with focal signs, or signs and symptoms of increased intracranial pressure [81,82]

Electroencephalography:

Routine electroencephalography (EEG) is not warranted, particularly in the setting of a neurologically healthy child with a simple febrile seizure [72].

EEG changes typically obtained after the post ictal period include spikes, 4-6/sec slow waves, or spike waves[84-86]. Specific abnormalities in EEG are more commonly seen in older children, in child with multiple previous episodes, after focal seizures, and in those preexisting motor abnormality [86]. However, these abnormal EEG findings are neither predictive nor prognostic of subsequent epilepsy or recurrences.

In children with complex febrile seizures, the requirement for an EEG depends on several components and clinical judgment. A prolonged seizure, or the one that has focal

signs, warrants an EEG and neurologic follow-up since the chances of future epilepsy is greater. The optimal timing of EEG is not well defined, but a study utilizing recordings performed within 72 hours of febrile status epilepticus suggests that this may be a useful timeframe for prognostic purposes [87].

Acute management:

Emergency rescue therapy:

The majority of febrile seizures have terminated spontaneously by the time the child is being evaluated for the first time, and the child is rapidly returning to the normal baseline. In such cases, active intervention with benzodiazepines is not warranted. Fever should be treated symptomatically.

Intravenous benzodiazepines (diazepam 0.1 to 0.2 mg/kg or lorazepam 0.05 to 0.1mg/kg) are effective in aborting seizure in many cases. If the seizure persists, an additional dose may be given. The child's respiratory and circulatory status should be monitored closely and an advanced airway intervention (eg, bag-mask ventilation, laryngeal mask airway, definitive artificial airway)must be undertaken if the spontaneous respiratory efforts or ventilation becomes inadequate .

The efficacy and safety of intravenous benzodiazepines as first-line agents for the treatment of seizures in children has been demonstrated in several randomized trials, primarily in children with afebrile seizures or status epilepticus [88.] In a randomized trial

published, however, it was concluded that lorazepam-treated children were more likely to be sedated (67 versus 50 percent) [89].

When intravenous access is unavailable or cannot be achieved, buccal midazolam is an effective alternative [90-92]; a typical dose is 0.2 mg/kg, maximum dose 10 mg. A study concluded that buccal or intranasal midazolam is as effective as intravenous diazepam in treating status epilepticus ,and buccal midazolam is superior to rectal diazepam in achieving seizure control [93]. Respiratory complications requiring assisted ventilation are similar, regardless of administration route. [94,95].

Febrile status epilepticus:

Children with prolonged or recurrent seizures despite initial benzodiazepine therapy should be treated promptly with additional anticonvulsant medications, as are other patients with status epilepticus. The most commonly used drug in this setting is fosphenytoin (20 mg phenytoin equivalents [PE]/kg intravenously). Efforts must be made to lower the temperature with antipyretics and a cooling blanket.

Febrile status epilepticus rarely aborts spontaneously and often warrants the use of more than one medication to control [71]. In a prospective cohort study of 119 children presenting with prolonged febrile seizures (>30 minutes), 70 percent of children required more than one antiseizure drug, and delays in antiseizure drug administration were associated with longer seizure duration [71].

Prehospital treatment:

Treatment of prolonged seizures by paramedics with either intramuscular midazolam or iv lorazepam appears to be safe and effective in children with status epilepticus [97.]

In a prospective study of children presenting to the emergency department with prolonged febrile seizure (>15 minutes), 11 percent of those receiving rectal diazepam in the ambulance responded, compared with 58 percent of patients treated with intravenous diazepam [96,71].

Discharge disposition:

Most children with simple febrile seizures may not necessarily require hospital admission and can be discharged safely to home once they have attained the normal baseline and parents have been educated about the possibility of recurrent febrile seizures.

Children with focal or prolonged seizures may warrant a more extended period of observation, especially if there is a marked delayed in recovery to baseline or postictal focality. In addition, they are at greater risk of having multiple seizures within the index illness. [98]. 90%of recurrences occurred within the first 24 hours.

Additional components to consider whether to admit a child include the compliance of the outpatient follow-up (for focal or prolonged seizures), comfort level of the parents,

and severity of the underlying febrile illness (eg, hydration status, ability to take oral fluids).

Provision of home benzodiazepines:

In children having a history of prolonged febrile seizure, including febrile status epilepticus (FSE), diazepam rectal gel (0.5 mg/kg) can be administered by parents at home if the episode continues for longer than five minutes [99]. Parents can be taught to safely administer the medication at home, and one rectally administered dose will not lead to respiratory depression.

Whenever available, midazolam nasal spray is a safe alternative to rectal diazepam for home administration. A comparison of midazolam nasal spray and rectal diazepam solution for residential treatment of seizure exacerbations found that midazolam was equal in efficacy to diazepam, and drowsiness occurred in more than 50 percent of administrations for both drugs [100]. In children with recurrent febrile seizures, those with long duration (defined as lasting longer than 10 minutes) tend to have similar features in repeat episodes. Similarly, children who have multiple risk factors for recurrent febrile seizures (focal onset, multiple seizures during the episode) and have a prolonged febrile seizure often have prolonged recurrent febrile seizures [102].

Role of preventive therapy:

Prophylactic antiseizure drugs can reduce the incidence of recurrent febrile seizures, but given the benign nature of most seizures, the risks of side effects generally outweigh the benefits [103,104]. Use of antipyretics at the first sign of fever does not seem to give protection from recurrent febrile seizures.

Antiseizure therapy: [103,105]

Children with febrile seizures are a greater risk for recurrent febrile seizures as well as the development of afebrile seizures, suggesting a role for prophylactic therapy with chronic antiepileptic drugs. However, there is a general consensus that risks of antiepileptic drug therapy tremendously outweigh potential benefits for most patients.

The effectiveness of antiepileptic drugs was evaluated in a meta-analysis of studies for the prevention of recurrent febrile seizures . While treatment with phenobarbital, valproate, or intermittent oral or rectal diazepam was associated with reduced risk of recurrent seizures in the short term (six months to two years)[104.] The use of chronic antiepileptic drugs or the prevention of recurrent febrile seizures is does not correlate with a reduced risk of epilepsy[103].

A clinical practice guideline developed by the Committee on Quality Improvement, Subcommittee on Febrile Seizures of the American Academy of Pediatrics concludes that

neither continuous nor intermittent anticonvulsive therapy is recommended for children with one or more simple febrile seizures, depending upon the risk and benefits of effective therapies [103].

Treatment decisions should be individualized based upon underlying risk factors. However, careful clinical history and review of the EEG in cases of complex febrile seizures or febrile status epilepticus may reveal characteristics of an underlying epilepsy syndrome or potential risk for developing a temporal lobe epilepsy, such as acute focal slowing on EEG or subsequent mesial temporal sclerosis on MRI [83,87]. The benefits of antiepileptic drug therapy may be more significant than risks in such cases, particularly if caregiver's concern about recurrent seizures is high and the risks of antiepileptic drug therapy are carefully considered.

Antipyretics:

For children who have had febrile seizures, treatment with antipyretics at the time of a febrile illness may allay discomfort and be helpful in overall management, but it does not appear to affect the recurrence rate of febrile seizures [103,104]. In several clinical trials, it was found that antipyretics were not effective at preventing the recurrence of febrile seizures.The potential physiologic reasons why antipyretics do not prevent febrile seizures are antipyretics facilitate heat loss but do not retard temperature elevation or lower the threshold convulsive temperature during the initial stage of fever that triggers a

seizure [11]. Heat production is not inhibited by antipyretics, but heat dissipation is augmented by increased peripheral blood flow and sweating [108].

Both acetaminophen and barbiturates decreases the body temperature by depression of the central temperature regulatory mechanism. Phenobarbital inhibits heat production during the pyrogenic stage of the fever, whereas acetaminophen facilitates heat loss at the height of the fever or during its defervescence. The mechanism whereby phenobarbital reduces febrile seizure recurrence may be related to both an antipyretic and anticonvulsant effect [11].

Prognosis:

The prognosis for children with febrile seizures is favorable. While early reports had suggested that febrile seizures were associated with greater risk of sudden death, the results from a large population-based study signifies that the small excess in mortality among children with febrile seizures is restricted only to those with complex febrile seizures [109].

Neurologic outcomes:

Neurological sequelae, including newer neurologic deficits, intellectual impairment, and behavioral disorder, are infrequent following febrile seizures. Studies have proven that measures of cognition, motor ability, and adaptive behavior in children were similar

at one month after a first febrile seizure and one year later [111]. Whenever new deficits were reported, they have been documented only after complex prolonged febrile seizures[112].

In general, children with febrile seizures lasting longer than 30 minutes did not suffer any neurological impairment unless they developed afebrile seizures [45,113]. The children were assessed when they were 10 years old, and children who suffered from neurologic and developmental deficits prior to the first febrile seizure were excluded. No difference was found in measurements of academic progress in children with febrile seizures, whether simple, complex, or recurrent, compared within a controlled cohort [114].

REVIEW OF LITERATURE:

In a descriptive retrospective study on risk factors of recurrent febrile seizure done by Z.Habib et.al [115] at the Aga Khan University Hospital, Karachi, Pakistan, 16% of patients had experienced recurrent febrile seizure. Of them, 36.5% of patients had seizure with the temperature of 38.5- 39.5°C and 15% had at higher temperatures. Age, family history, developmental history, seizure type and given treatment had not affected the recurrence of seizures. Past history of seizure, number of past seizures, duration of seizure, multiple seizures were significant factors leading to recurrence of seizures. In this study they concluded that duration more than five minutes was the most important prognostic factor for recurrence of febrile seizures and Early treatment did not reduce the recurrence of febrile seizures.

Another study was conducted by Ausi Indirani et.al [116] in West Java, Indonesia, on recurrent febrile seizure risk factors. In this study, the following variables were analyzed.

1. Age at the first febrile seizure
2. Febrile seizure type
3. Duration of fever before the onset of seizure
4. Body temperature while convulsing

5. Family history of FS
6. Family history of epilepsy

58 Out of 154 children with FS had recurrent febrile seizures. Of these, 43% experienced a first FS at the age of < 12 months, 72% were male, 46% had experienced fever < 24 hours before the onset of FS, 65% had experienced complex FS, family history of FS were positive in 28%, and family history of epilepsy were positive in 5% of patients. In this study they declared that age < 12months, male child, short duration of fever before FS onset and complex FS were the most important risk factors for recurrence of febrile seizure.

In a case control study on risk factors for recurrent FS done by Nadirah rasyid ridha et.al [(117)] at Wahidin sudiro husodo and Labuang baji hospital, Makassar, Indonesia, age < 18 months, family history of FS and duration of fever < 12 hours before first FS were the risk factors associated with recurrence of FS. A low grade temperature at first FS did not increase the recurrence. Finally, in this study younger age and less fever duration before the first febrile seizure were the risk factors associated with increased recurrence of febrile seizure.

Another prospective study on recurrence risk of FS in children was conducted by Jyoti Agrawal et.al [(118)] at Bishweshwar Prasad Koirala institute of health

sciences, Dharan, Nepal. Males were 70% and females were 30%. Simple febrile seizure was 48% and complex febrile seizures were 52%. One third of patients had experienced recurrence. URI was the most precipitating factor for FS. GTCS was the most common type of seizure. Males and age < 1 yr were the significant risk factors for recurrence of febrile seizure. Most of recurrence had occurred within 1 yr of first FS.

A retrospective study on first FS and risk factors for recurrent FS in Hong Kong children by KK Chan et.al [119] at Kwong Wah hospital , Kowloon, Hong Kong, China revealed the following results.

Table 6 Association with risk factors

Results	%
GTCS	51.6
Complex febrile seizure	23.3
Family history of FS	18.2
Family history of epilepsy	2.5
Recurrence of FS	22.6
Development of epilepsy	1.3

The one and only significant risk factor for recurrence of FS was younger age.

Another research on recurrent risk of FS in children by Anil raj ojha et.al [120] which was a prospective cohort study at Kathmandu medical college and teaching hospital, Kathmandu, Nepal, showed that out of 115 children with febrile seizures, 62% were males, 38% were females, and 80% had simple febrile seizures, 20% had complex febrile seizures. 59% had viral prodromal symptoms. 51% of patients had experienced recurrent febrile seizures. In this study, they finalized that complex febrile seizures, modest rise of temperature preceding febrile seizure and short duration of fever less than 12 hours prior to febrile seizure were the important risk factors for recurrence of febrile seizures.

A case control study was conducted by Yusra Fayyadh Alwan et.al [29] on risk factors of recurrent FS in children at Central Children Teaching Hospital, Baghdad, Iraq. In this study, 67% with recurrent FS were younger (4-12 months) at first episode of seizure, 70% were males, 45% of cases had low degree of temperature rise at onset of seizure, 83% had frequent febrile illnesses. Family history (first degree relative), history of epilepsy also had significance. So, age < 1year, male, low degree of temperature rise preceding seizure family history (1°) , history of epilepsy were the significant risk factors for recurrent febrile seizures. Type of seizure, duration of fever before onset of seizure, family history (2°) of FS were not significant risk factors for recurrence of FS.

In a descriptive study on age, temperature, and recurrence of febrile seizure by Margriet Van stuijvenberg et.al [122] at Sophia children's hospital, Rotter Dam and Juliana children's hospital, Den Haag, Netherland, 52% of recurrent FS occurred within two hours of onset of fever and they had low median temperature (39.3°C) while comparing rest of them (48%) who experienced recurrence after 2 hours of onset of fever and temperature of 40°C. Finally, they concluded that younger age and high temperature at onset of fever and high temperature during the fever episode were the important risk factors for recurrence of FS.

A prospective study of recurrent FS conducted by Berg AT et.al [121] showed the following results:

25% of recurrent FS occurred at 1 year and 30% at 2 years.

Table 7 Association with duration of fever:

Duration of fever before initial seizure (hours)	Risk of recurrent FS at 1 year (%)
<1	44
1-24	23
>24	13

Table 8 Association with intensity of fever

Temperature rise (°F)	Risk of recurrence at 1 year (%)
101	35
102	30
103	26
104	20
≥105	13

Age < 18 months, family history of FS were also associated with increased risk of recurrent FS. Complex FS, family history of epilepsy and neurodevelopmental abnormalities were not associated with increased risk of recurrent FS. In this study they had concluded that low temperature rise and shorter duration of fever preceding initial FS were the significant risk factors for recurrent febrile seizure.

Another study (prospective cohort study) done by the former author Berg AT et.al [(102)] on predictors of recurrent FS showed that young age at onset of FS, family history of FS (first degree relative), low degree of fever, short duration between beginning of fever and first seizure were the significant predictors for recurrent febrile seizure. In this study, recurrent FS had occurred as follows:

Table 9 Recurrent febrile seizures :

No. of recurrence	% of children
1	17.1
2	8.9
3	5.8

In a descriptive retrospective study on the factors affecting the risk of recurrent FS in Saudi children by M Musarrat Jamal et.al [123] at King Khalid Hospital, Hail, Saudi Arabia, most of children (47.73%) had viral infection, 34.85% of children had experienced recurrence. There was a strong association between the recurrent FS and the following factors:

Table 10 Association with risk factors for recurrence:

Factors	Association (%)
Age < 12months at first FS	65.22
Complex FS	69.57
Low degree of fever at beginning of FS	65.22
Duration of fever (≤ 6 hrs) preceding FS	56.52

Sex and family history were not associated with recurrence of febrile seizure. Finally, they had concluded that 1/3 of these patients were at risk for recurrent FS and younger age at initial FS, modest increase in temperature prior to FS, shorter duration of fever (≤ 6 hours) preceding FS, complex FS were the significant risk factors for recurrence of febrile seizure.

Another descriptive retrospective study was done by Razieh Fallah et.al [124] on recurrence of FS at Shahid Sadoughi Hospital, Yazd, Iron. In this study, 37% of children had recurrence of FS and of these, 60% were infants and 30% were children > 1 year of age. 63% with recurrence had initial FS within 1 hour of fever and 33%, after 1 hour of fever. They finalized that initial FS in < 1 year of age and within 1 hour of fever had increased the risk for recurrence.

In a retrospective study on characteristics of FS and risk factors for its recurrence conducted by Worawit Kantamalee et.al [125] at Chiang Mai University Hospital, Thailand, out of 261 cases with FS, 52 cases (19.9%) had recurrent FS. Respiratory tract infections were the most common etiology for febrile illness. Young age at first FS and family history of febrile seizures were the significant risk factors for recurrence of FS.

Another case control study on risk factors for febrile seizure was done by Essam J AL-Zwaini et.al [126] at maternity and children hospital, Ramadi city, Iraq. In this study, 64% of cases had experienced first FS and 36% had recurrent FS. In this study they finalized that the following factors had a strong association with occurrence and also recurrence of febrile seizures.

- Male sex
- Degree of fever on admission
- Family history of FS or epilepsy
- Developmental delay
- Anemia

Patients were more prone for development of recurrent febrile seizure at a lower temperature following their first FS attack.

Another study on risk factors for recurrence of febrile seizures by H Rantala et.al[127] had found that in a total of 167 children with febrile convulsion, 35 (21%) had experienced recurrent febrile seizures. The number of febrile episodes and history of FS in first degree relatives were the significant risk factors for recurrence of febrile seizures.

In a case control study done by Mashaer Abidlqader et. Al [128] on IDA and vulnerabilities to FS at Gafar Ibn Ouf pediatric specialized Hospital and Omdurman Emergency pediatric Hospital, Sudan, 62.7% of cases had iron deficiency anemia while comparing control group in whom, 34.2% had IDA. Mean Hb level and also MCV, MCH, S.Ferritin, S.Iron were lower in cases with FS than in control groups with statistical significance. Anemic children with simple FS had lower hematological indices than those with anemia and complex FS with statistical significance. Finally, they concluded that IDA and low hematological indices were more common in cases with simple FS than those with complex FS.

In a prospective study on serum sodium levels and recurrent FS by M Kulandaivel [129] at Government Sivagangai Medical College Hospital, Sivagangai, Tamil Nadu, India, out of 190 children with FS, 53 children (29%) developed recurrence. The mean sodium (Na+) level in the children with recurrent FS was 132.26 mmol/l which was significantly lower than the mean in the children without recurrent FS. Finally, he declared that the probability of a recurrent FS was increased when the serum sodium (Na+) level decreased significantly ($P = 0.0025$).

AIM OF THE STUDY:

To estimate the various risk factors for recurrence of febrile seizures in children aged 6 months to 60 months admitted in a tertiary care hospital.

OBJECTIVES:

- To investigate the effect of age, gender, temperature, past history of seizure, developmental and family history, duration, type and number of seizure on recurrence of febrile seizures.
- To describe the distribution of age, gender, duration of fever, type and duration of seizure in occurrence of febrile seizure.

STUDY DESIGN:

Descriptive study

STUDY PLACE:

Paediatric ward, Department of Paediatrics, Govt Theni Medical College Hospital.

STUDY PERIOD:

The study period extended from July 2017 to June 2018.

STUDY POPULATION:

Children aged 6 months to 60 months with both simple and complex febrile seizures admitted in Theni Medical College Hospital, Theni.

ETHICAL COMMITTEE APPROVAL:

The ethical committee of the Govt Theni Medical College approval was obtained prior to the commencement of the study.

INCLUSION CRITERIA:

- Children aged 6 months to 60 months with both simple and complex febrile seizures admitted in Theni Medical College Hospital, Theni.

EXCLUSION CRITERIA:

- Children with seizure suspected to have central nervous system infection (meningitis, encephalitis) on first day itself and also diagnosed following LP.
- Children with seizure due to hypocalcemia and hypomagnesemia
- Children with at least one episode of afebrile seizure
- Seizure following trauma, drug or toxin intake
- Seizure in children with CSOM

METHODOLOGY:

After getting informed written consent from the parents or care givers, Children of both sexes from 6 months to 60 months of age having simple or complex febrile seizure were admitted and investigated regarding various risk factors for recurrence of febrile seizure. Other etiologies causing fever with seizure were excluded by history, clinical examination and relevant investigations. Children with recurrent febrile seizures were reviewed with their old records. All children either first episode or recurrence were followed up fortnightly in specialty OPD during the study period. Missed children were followed up whenever they had come to OPD.

History:

They were asked about general information like name, age, sex, address and about presenting complaints. If the complaints were fever with seizure, then they were investigated regarding duration of fever prior to seizure, intensity of fever, type of seizure, duration of seizure, number of seizure, associated other symptoms, past history of febrile seizure, family history of febrile seizure and epilepsy and regarding developmental mile stones. In case of children with past history of febrile seizure, they were also queried about the age at initial febrile seizure, total episode of seizures. According to history, children who had seizure associated with fever following trauma or drug / toxin intake were excluded.

Clinical examination:

After exclusion by history, the remaining children were examined for other causes of fever associated with seizure mainly, features of increased ICP and CSOM. If any child had the above mentioned features, he / she was excluded. The remaining children were subjected to the following investigations.

Lab investigations:

- Hemoglobin

  If Hb level was less than 11 g / dl, it was considered as anemia.

- Random blood sugar

  Any child who had RBS less than 54 mg / dl, was excluded from this study.

- Renal function test

  Children with elevated RFT were also excluded. (urea > 40 mg / dl, Creatinine > 1 mg / dl)

- Serum electrolytes:

  - Serum sodium

    Serum sodium level less than 135 meq / L was considered as low sodium level.

- Serum Potassium

  Children with K+ either < 3.5meq / L or > 5meq / L were considered as having abnormal potassium level and excluded.

- Serum calcium.

  Serum Calcium < 9 mg /dl was considered as hypocalcemia and children having hypocalcemia were excluded from this study.

- Brain imaging and EEG were done in selected children when there was suspicion of CNS infection or other seizure disorders. If the findings were abnormal, then that child was excluded.

- CSF analysis was done in the following situations and the report was abnormal , then the child was excluded from this study.

  - ✓ LP was performed when there are meningeal signs or symptoms or other clinical features suggestive of a possible meningitis or intracranial infection

  - ✓ LP was considered in infants between 6 and 12 months if the immunization status for H. influenzae type b or Streptococcus pneumoniae is deficient or can't be determined.

  - ✓ LP was considered when the patient is on antibiotics since antibiotic therapy can mask the signs and symptoms of meningitis

After exclusion, the data was entered in the proforma. Then the children were categorized as following ;

Categorization of Risk factors:

1. Age (<12 months, ≥12 months)
2. Gender (male, female)
3. Duration of fever (<24 hrs, ≥24 hrs)
4. Intensity of temperature (<102.2°F, ≥ 102.2°F)
5. Type of febrile seizure (simple, complex)
6. Duration of seizure (< 5min , > 5 min)
7. Past history of febrile seizure (recurrence) (yes, no)
8. Number of recurrence (single, multiple)
9. Family history of febrile seizure (positive, negative)
10. Family history of epilepsy (positive, negative)
11. Developmental history (normal, delayed)
12. Hemoglobin (<11g/dl, ≥ 11g/dl)
13. Serum Sodium (<135meq , 135-145meq)

STATISTICAL ANALYSIS

The data collected from the selected subjects were recorded in Master Chart. The values analyzed with the help of SPSS version 16. Bivariate statistical analysis of Chi – Square test was used to analyze and describe the effect of various risk factors on recurrence febrile seizure.

'p' value less than 0.05 was considered to denote significant relationship. Microsoft word & excel sheet were used to create tables, charts and graphs.

RESULTS

In Theni Medical College Hospital, a total of 5239 Children were admitted in pediatric ward. Among them, 223 children were diagnosed as having febrile seizures based on the clinical presentation and enrolled. In this study, the prevalence of febrile seizures was 4.25% among total admission.

Age distribution:

Table 11 Age distribution

Age	Frequency	Percent
< 1 yr	40	17.9
>1 yr	183	82.1
Total	223	100

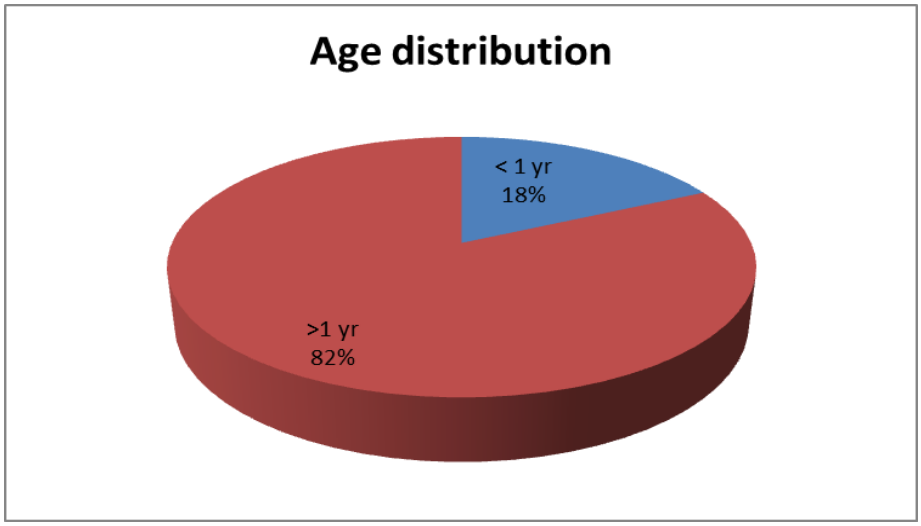

Figure 1: Age distribution

Out of 223 children, 40 children (17.9%) were less than one year old and rest of them (82.1%) were more than one year old.

Sex distribution:

Table 12 Sex distribution

Sex	Frequency	Percent
Male	146	65.5
Female	77	34.5
Total	223	100

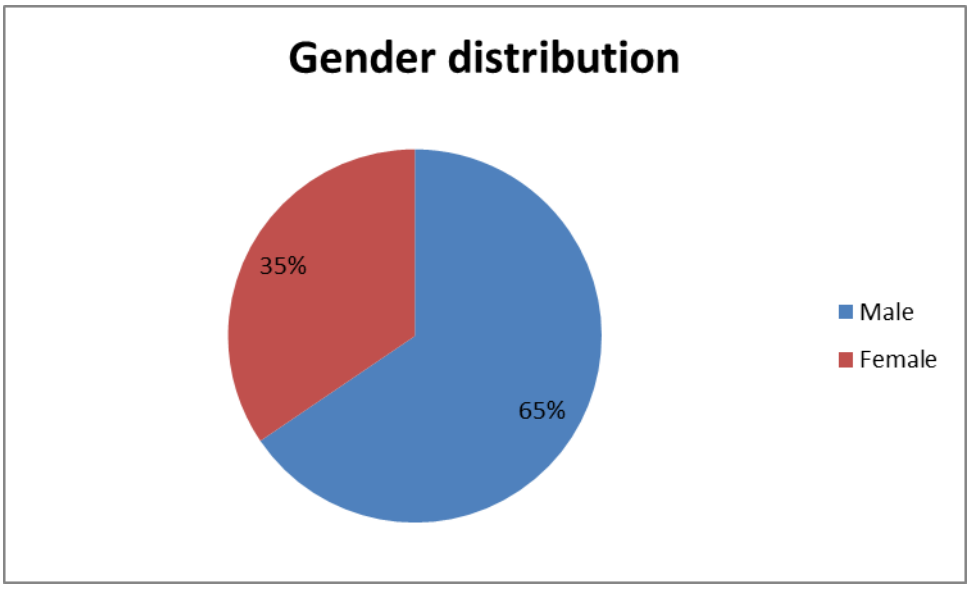

Figure 2: Sex distribution

Among the children with febrile seizure, 146 children (65.5%) were males and 77 children (34.5%) were females. The male female ratio is 1.9: 1. It denotes that male children more commonly experienced febrile seizures than female children.

Association between onset of fever and seizure :

Most of the children , 181 (81.2%) developed febrile seizure within the period of 24 hours from the onset of fever. Rest of them, 42 (18.8%) had experienced febrile seizure after 24 hours from the onset of fever.

Table 13 Association between onset of fever and seizure :

Duration of Fever	Frequency	Percent
<24 hour	181	81.2
>24 hour	42	18.8
Total	223	100

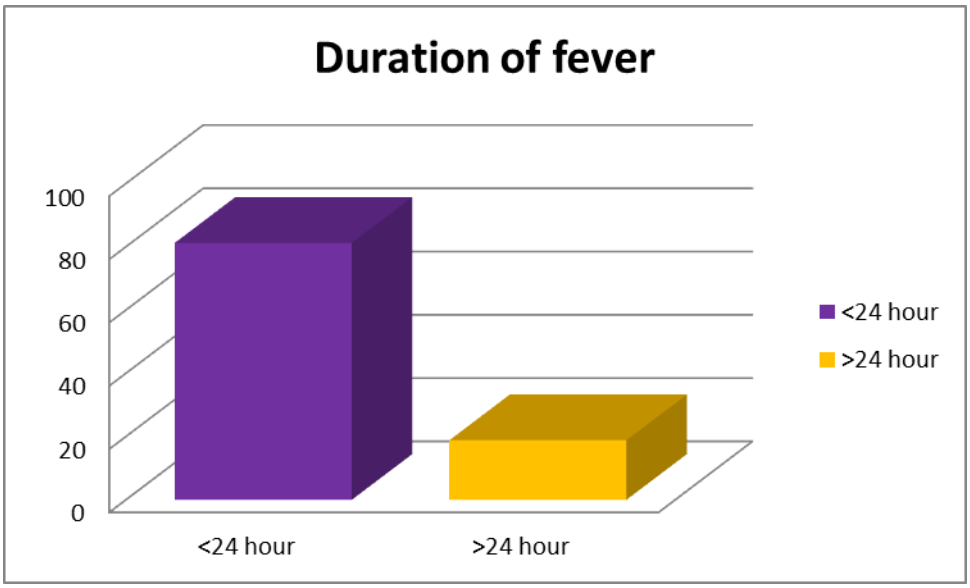

Figure 3: Association between onset of fever and seizure

Break up according to type of seizure:

Among 223, 201 (90.1%) had experienced simple febrile seizure and others , 22 (9.9%) had complex febrile seizure. Hence, simple febrile seizure is the most common type of febrile seizure.

Table 14 Break up according to type of seizure:

Type of Febrile seizure	Frequency	Percent
Simple	201	90.1
Complex	22	9.9
Total	223	100

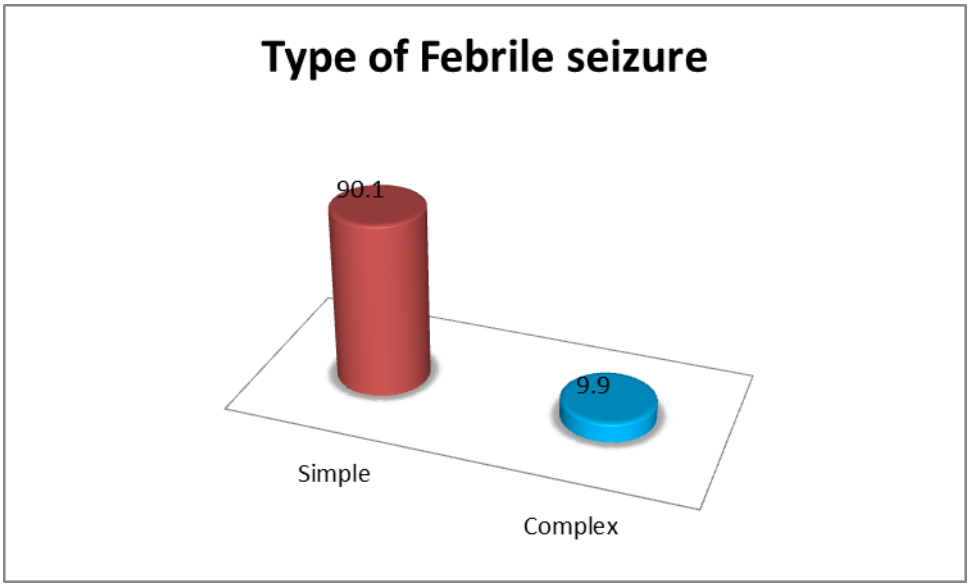

Figure 4 :Break up according to type of seizure**:**

Break up according to duration of seizure:

Out of 223 patients, 160 patients (71.7%) experienced seizure lasting for less than 5 minutes and 63 patients (28.3%) had seizure lasting for more than 5 minutes.

Table 15 Break up according to duration of seizure:

Duration of Seizure	Frequency	Percent
< 5 mins	160	71.7
> 5 mins	63	28.3
Total	223	100

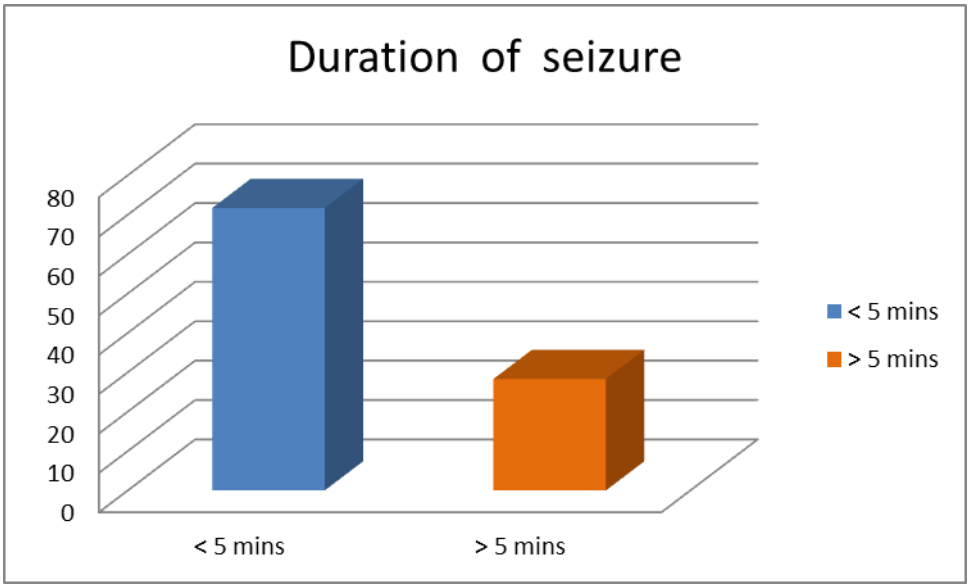

Figure 5: Break up according to duration of seizure

Recurrent febrile seizures:

Among 223 children with FS, 111 children (49.8%) had developed recurrent febrile seizures in the upcoming years. Rest of the children (50.2%) did not have even one recurrence.

Table 16 Recurrent febrile seizures:

Recurrent FS	Frequency	Percent
No	112	50.2
Yes	111	49.8
Total	223	100

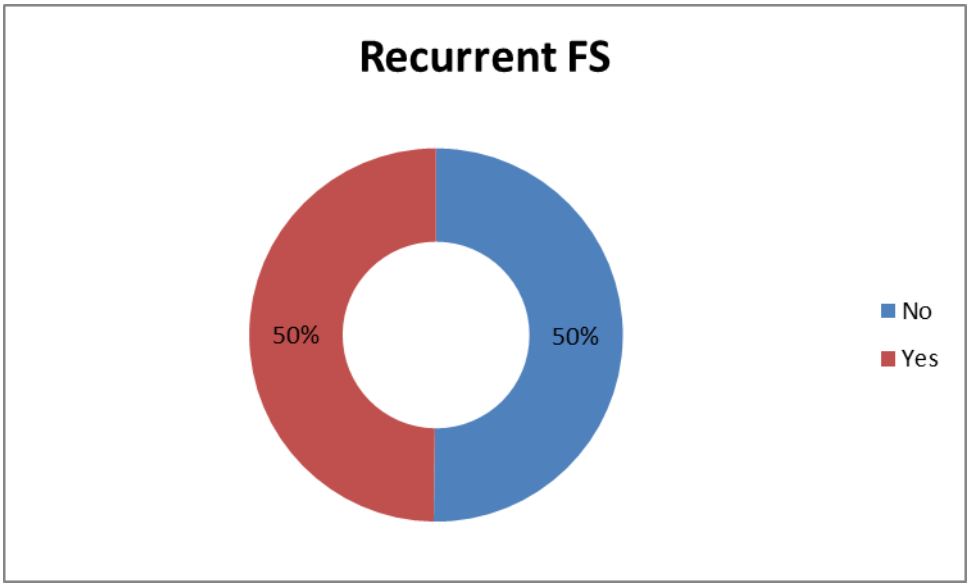

Figure 6 Recurrent febrile seizures

Association with age while developing first FS:

Among 111 children with recurrent FS, 81 children (73%) had experienced initial febrile seizure when they were less than one year old. But, other 30 in number (27%) developed their first FS after their first birth day. Most of the children with recurrent FS had experienced their initial febrile seizure prior to their first birth day. Hence, it is one of the most important risk factor for recurrent FS.

Table 17 Association with age while developing first FS:

Age at first FS	Frequency	Percent
<1 yr	81	73
>1 yr	30	27
Total	111	100

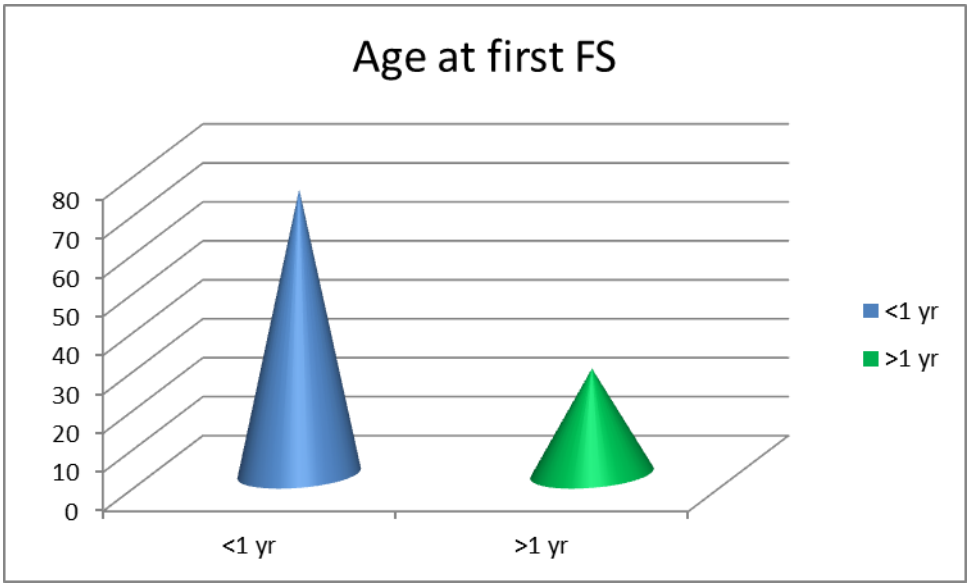

Figure 7: Association with age while developing first FS

Table 18 Bivariate analysis

Age at first FS	Recurrent FS			Chi sq	p
	No	Yes	Total		
<1 yr	0	81	81	125.22	**0.0001**
>1 yr	112	30	142		
Total	112	111	223		

Age less than 1year while developing febrile seizure had a statistically significant association with recurrence of febrile seizure (p = 0.0001).

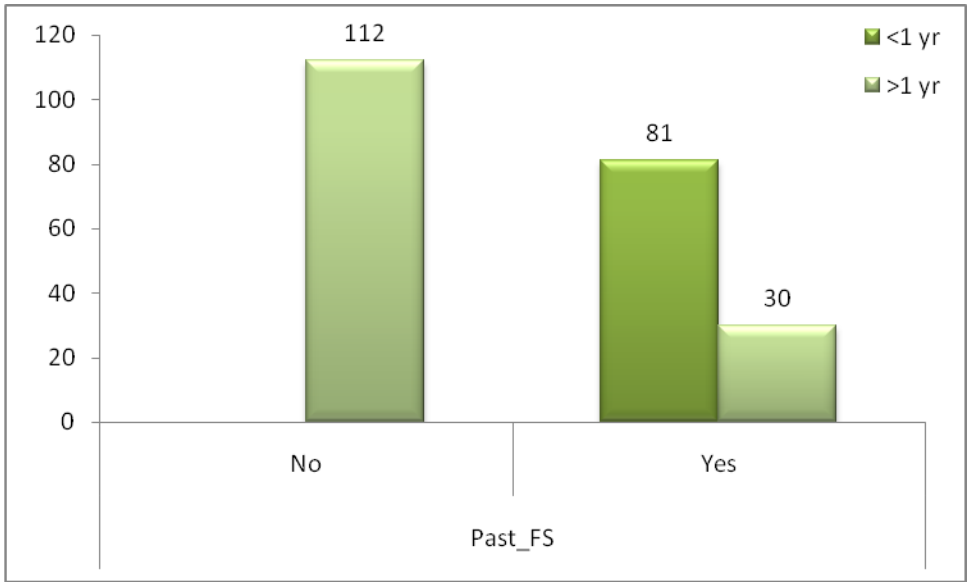

Figure 8: Bivariate analysis

Sex distribution in recurrent FS:

Most of the children (74.8%) are male among 111 children with recurrent febrile seizure. Other 25.2% are female children. So, male children are more prone for developing recurrent febrile seizure.

Table 19 Sex distribution in recurrent FS

Sex	Frequency	Percent
Male	83	74.8
Female	28	25.2
Total	111	100

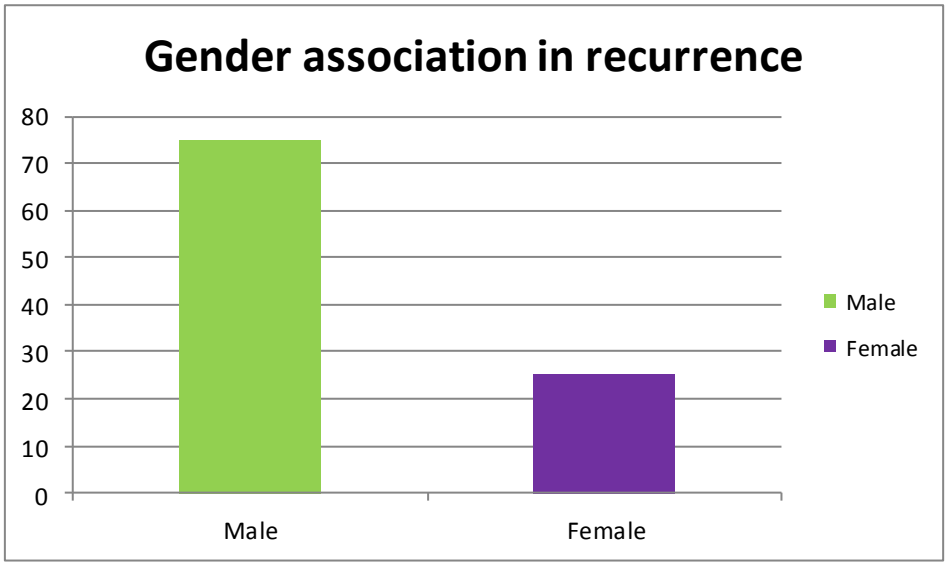

Figure 9: Sex distribution in recurrent FS

Table 20 Bivariate analysis

Sex	Recurrent FS			Chi sq	p
	No	Yes	Total		
Male	63	83	146	7.66	**0.006**
Female	49	28	77		
Total	112	111	223		

Male children had a significant association with recurrence of febrile seizure statistically with the p value of 0.006

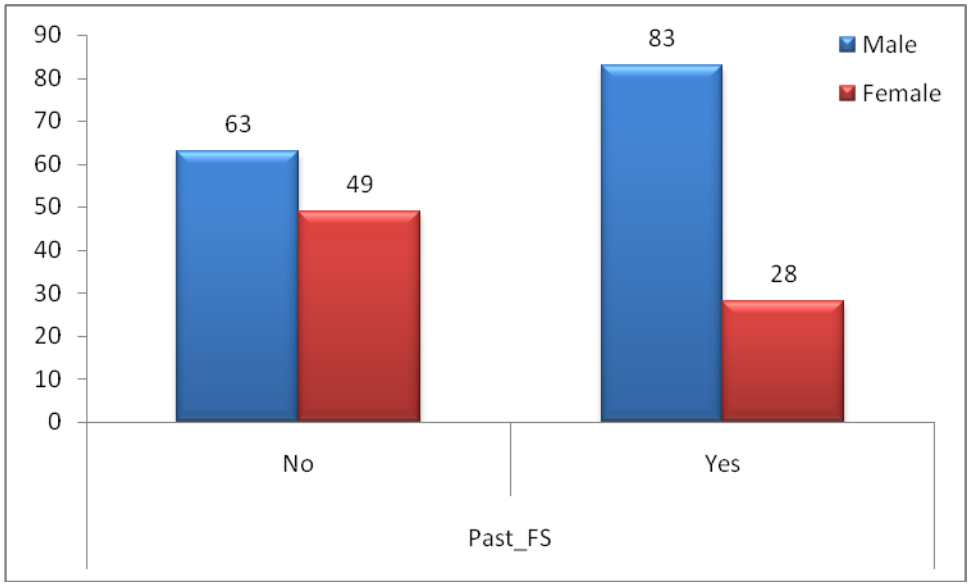

Figure 10: Bivariate analysis

Association of fever duration with recurrent FS:

Out of 111 patients with recurrent febrile seizures, 82 patients (73.9%) developed seizures within 24 hours of onset of fever. Rest of the 29 patients (26.1%) developed after 24 hours of onset of fever. Hence, duration of fever less than 24 hours from the onset of fever has a strong association with the development of recurrent febrile seizure.

Table 21 Association of fever duration with recurrent FS

Duraton of Fever	Frequency	Percent
<24 hour	82	73.9
>24 hour	29	26.1

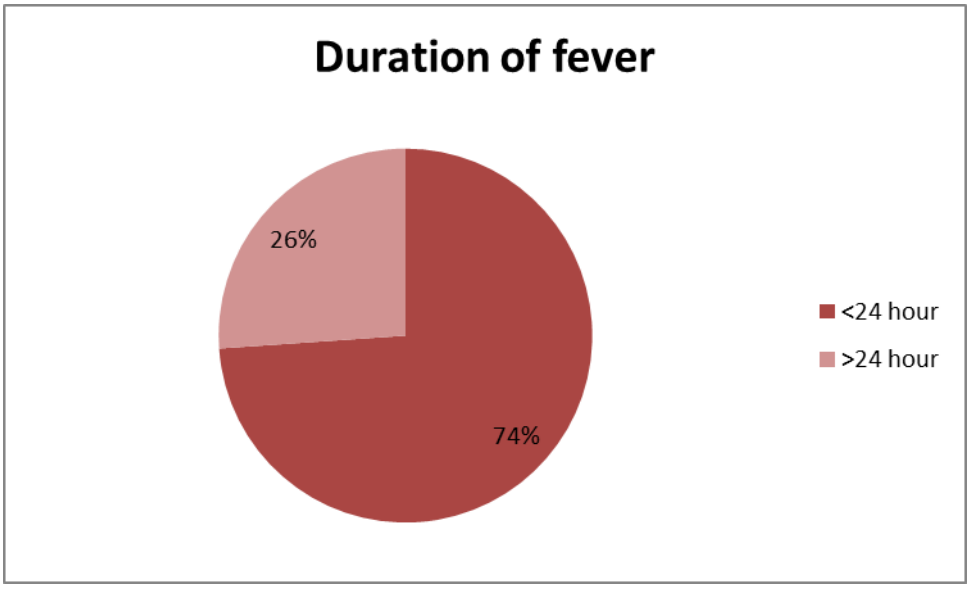

Figure 11: Association of fever duration with recurrent FS

Table 22 Bivariate analysis

Duration of fever	Recurrent FS			Chi sq	p
	No	Yes	Total		
<24 hour	99	82	181	6.77	**0.01**
>24 hour	13	29	42		
Total	112	111	223		

This bivariate analysis had shown that the duration of fever less than 24 hours prior to the seizure was a significant risk factor for recurrence of febrile seizure (p = 0.01)

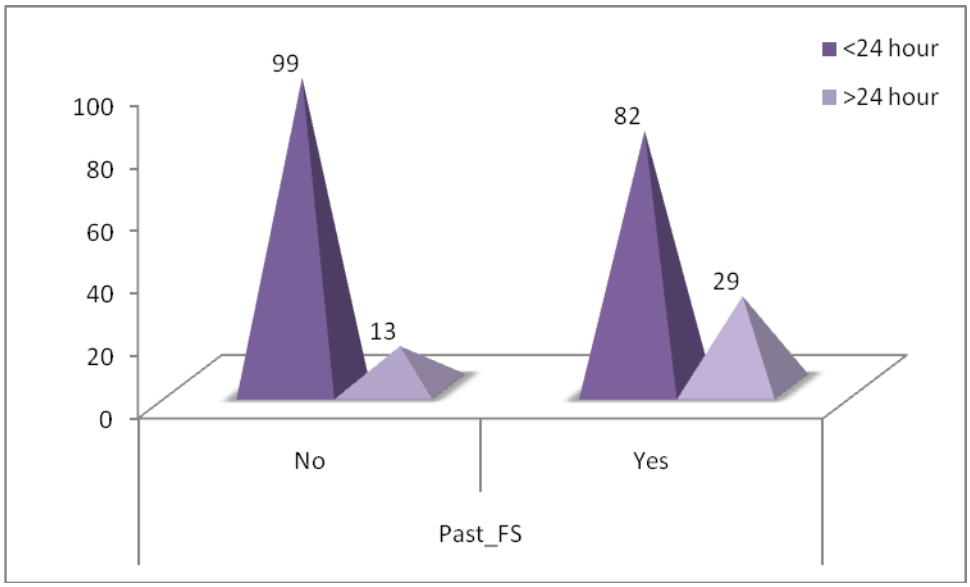

Figure 12: Bivariate analysis

Association with multible episode of recurrent FS:

Out of 111 children with recurrent FS, 64 children (57.7%) had experienced more than one episode of recurrence and other 47 children (42.3%) had only one recurrent FS. Hence, number of recurrent episode itself increases the frequency of recurrent FS. So, it is also an important risk factor for recurrent FS.

Table 23 Number of recurrent febrile seizure

Recurrent FS number	Frequency	Percent
1	47	42.3
>1	64	57.7
Total	111	100

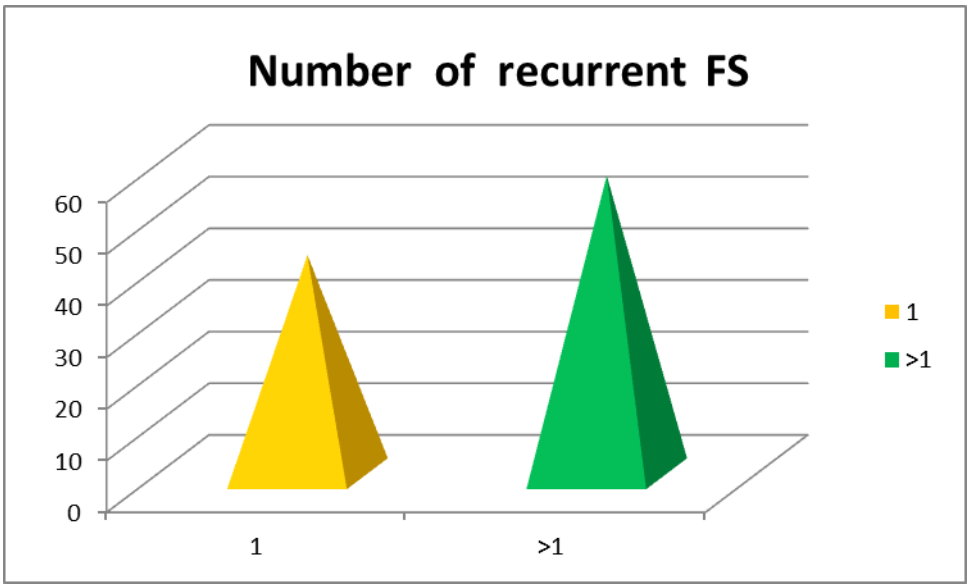

Figure 13: Association with multible episode of recurrent FS

Table 24 Bivariate analysis

Recurrent FS number	Recurrent FS			Chi sq	p
	No	Yes	Total		
1	68	47	115	6.82	**0.004**
>1	44	64	108		
Total	112	111	223		

Multiple recurrent febrile seizure had itself increased the recurrence significantly (p = 0.004)

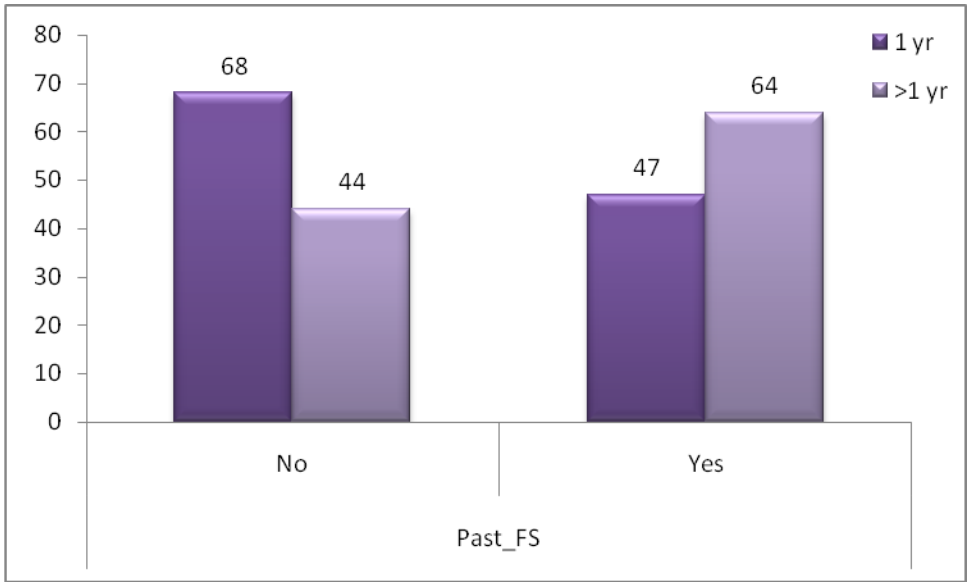

Figure 14**:** Bivariate analysis

Association with family history of FS:

Among children with recurrent FS (111), 60 children (54.1%) did not have family history of febrile seizure either in 1° or 2° relatives. 51 children (45.9 %) had significant family history of FS. Hence, family history of FS either in 1° or 2° relatives does not affect the recurrence of febrile seizure.

Table 25 Association with family history of FS:

Family FS	Frequency	Percent
No	60	54.1
Yes	51	45.9
Total	111	100

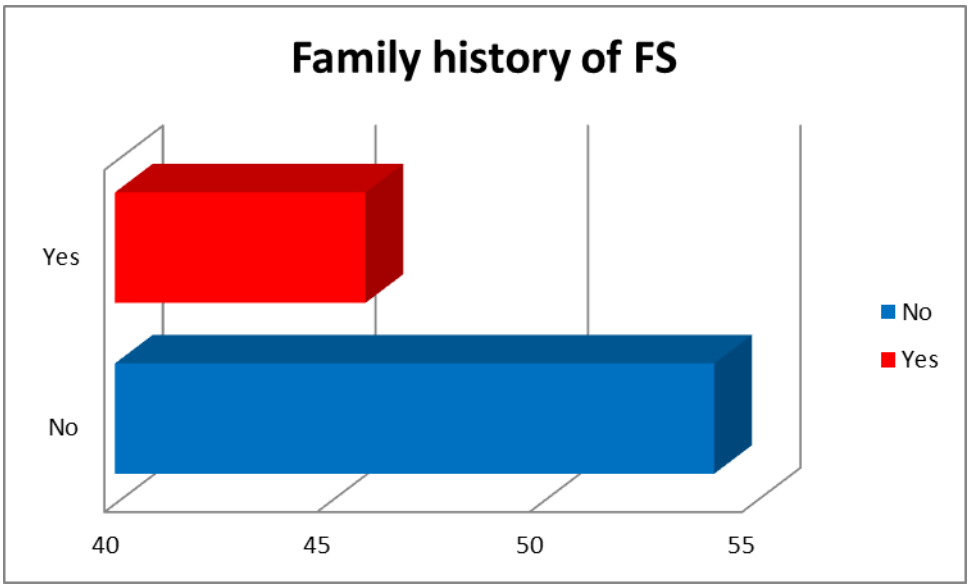

Figure 15: Association with family history of FS

Table 26 Bivariate analysis

Family FS	Recurrent FS			Chi sq	p
	No	Yes	Total		
No	68	60	128	1.01	0.3
Yes	44	51	95		
Total	112	111	223		

Family history of recurrent febrile seizure did not have significant association with recurrent febrile seizure in the child (p = 0.3)

Association with anemia:

According to WHO guideline, anemia is defined as hemoglobin level is less than 11 g /dl. Out of 223 children with FS, 132 children (59.2%) had Hb < 11 g / dl. Other 91 children (40.8%) had Hb > 11g / dl. Hence, anemia may be a risk factor for development of febrile seizure.

Table 27 Association with anemia:

Hb (g / dl)	Frequency	Percent
<11	132	59.2
>11	91	40.8
Total	223	100

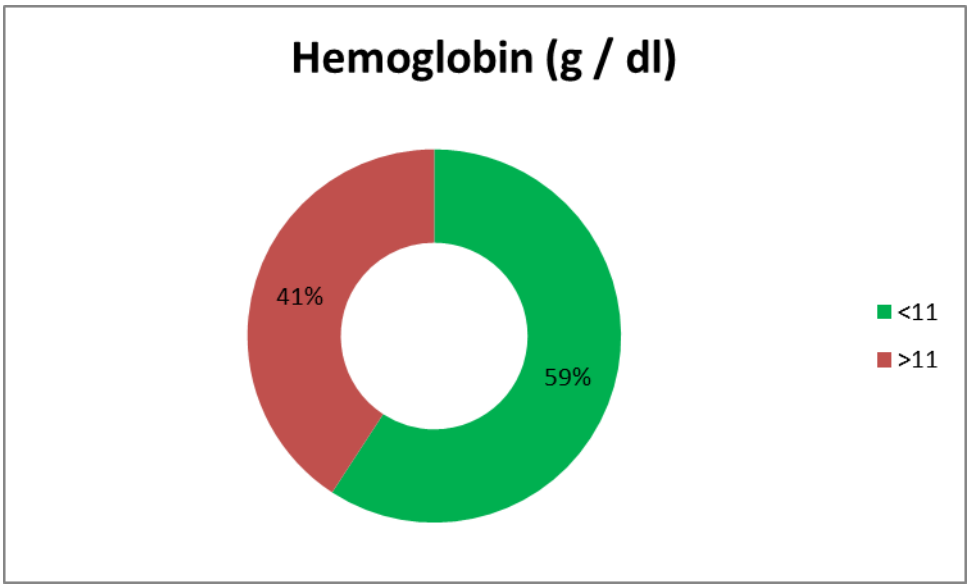

Figure 16 : Association with anemia

It may be a risk factor for development of recurrent FS. Because, among 111 children with recurrent FS, anemia was seen in 67 children (57.7%). Rest of them are not anemic (42.3%) and had Hb > 11 g / dl. But, this is not statistically significant (p = 0.6).

Table 28 Association with anemia in recurrence:

Hb (g / dl)	Frequency	Percent
<11	64	57.7
>11	47	42.3
Total	111	100

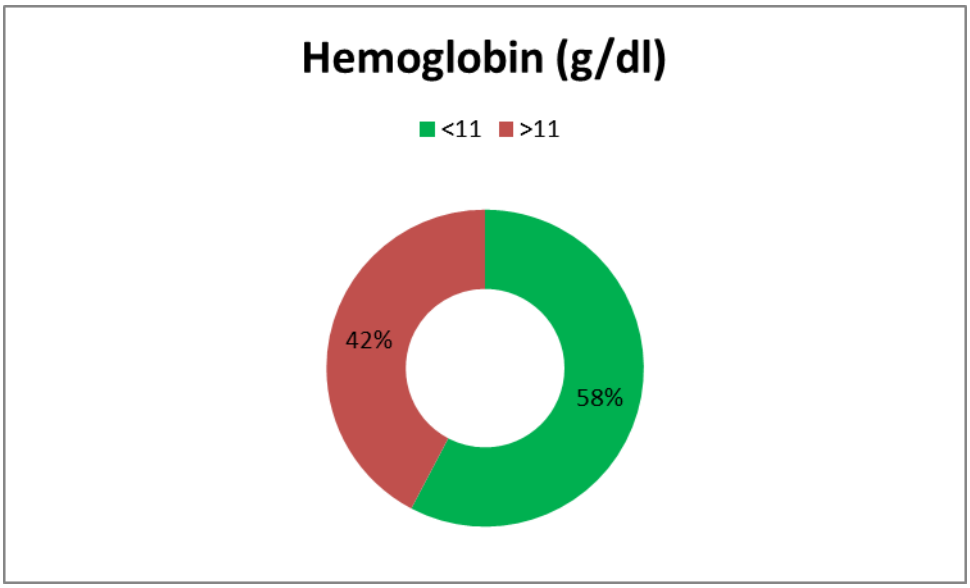

Figure 17: Association with anemia in recurrence

Table 29 Bivariate analysis

Hb(g / dl)	Recurrent FS			Chi sq	p
	No	Yes	Total		
<11	69	64	132	0.2	0.6
>11	43	47	91		
Total	112	111	223		

Children with anaemia did not have statistically significant increased risk of recurrent febrile seizure (p = 0.6)

Association with serum sodium:

Among 223 patients with FS, 52 patients (23.3%) had low serum sodium levels (< 135 meq / L). Other 171 patients (76.7%) had normal serum sodium level. So, low serum sodium level is not a risk factor for febrile seizure.

Table 30 Association with serum sodium:

Na+	Frequency	Percent
<135	52	23.3
135-145	171	76.7
Total	223	100

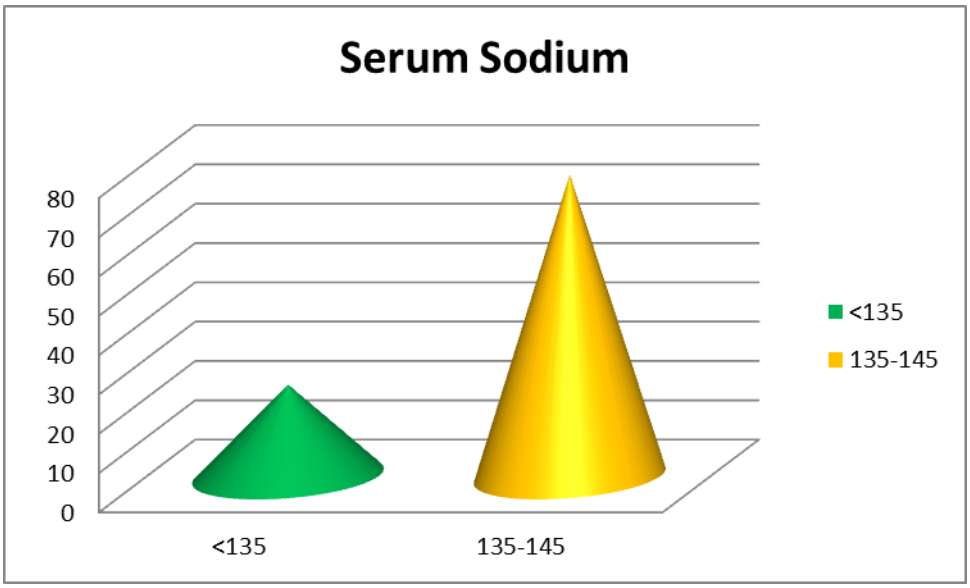

Figure 18 : Association with serum sodium

Same as above, out of 111 patients with recurrent febrile seizure, 30 patients (27%) had low serum sodium levels (< 135 meq / L). rest of them (73%) had normal serum sodium level. So, low serum sodium level is not a significant risk factor for recurrent febrile seizure.

Table 31 Association with sodium in recurrence:

Na+(meq / L)	Frequency	Percent
<135	30	27
135-145	81	73
Total	111	100

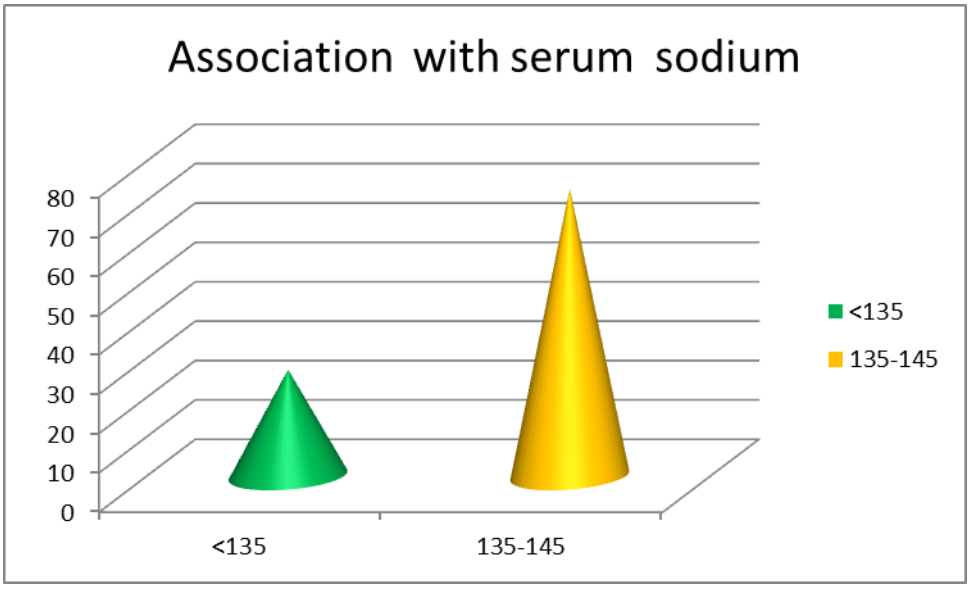

Figure 19: Association with sodium in recurrence

Table 32 Bivariate analysis

Na^+ (meq/L)	Recurrent FS			Chi sq	p
	No	Yes	Total		
<135	22	30	52	1.69	0.2
135-145	90	81	171		
Total	112	111	223		

Sodium level less than 135 did not have statistically significant increased risk of developing recurrent febrile seizure (p= 0.2)

Finally, in this study, Age at first febrile seizure less than one year , male sex, duration of fever less than 24 hours, multible recurrent febrile seizure were having statisticaly significant relationship ($p<0.05$) with recurrence of FS.

Duration of seizure, family H/o FS, anemia, low serum sodium level at the time of presentation didn't have significant relationship with recurrence of FS.

DISCUSSION :

Recurrent febrile seizures:

In the present study , it has been found that 49.8% of children with FS had experienced recurrence. Similarly, Anil Raj Ojha et.al [120] revealed that 51% of enrolled children had developed recurrence during the study period in their study. Ausi Indriani et.al [116] also found that 37.6 % had recurrent FS out of 154 patients with FS. In the study of Jyoti Agrawal et.al [118], 1/3 of children had recurrent febrile seizures among 92 children. In a study by Z.Habib et.al [115], among children with FS, 16% of children had experienced recurrence. In a study by KK Chan et.al [119], 22.6 % children had experienced recurrent febrile seizures. . Berg AT et.al [121] shown that 27 % of children in their study had experienced recurrent FS.

Age distribution:

In this study, we included children aged 6 to 60 months with febrile seizure and found that children with age less than 12 months at first FS (73%) had increased incidence of recurrent FS. Likewise, Nadirah rasyid ridha et.al [117] , in their study, revealed that the children having first FS within 18 months of age were 71.37 times more prone for developing recurrent FS. In a study by Berg AT et.al [121], shown that 66 % of children with recurrent FS were less than 18 months

old (p <0.01). In a study by Ausi Indriani et,al [116], they enrolled the children with FS who were 1month to 7 years old. There was 43% of children with recurrent FS , who had first FS before their first birthday and 38% at 12 – 24 months, 9% at > 24 months. Jyoti Agrawal et.al [118] denoted that age less than 1year at first FS had more recurrence with the p value of 0.04 in their study. KK Chan et.al [119] revealed that younger age was the most significant risk factor for the development of recurrent FS in their study (p < 0.001). Yusra Fayyadh alwan e.al [29] , in their study, concluded that 67% cases with recurrent FS were aged between 4 and 12 months (p = 0.01)

Gender distribution:

In the present study, 74.8% children with recurrence were males and 25.2% were females. Similarly, Z.Habib et.al [115] , in their study, concluded that among children with recurrent FS, 57% were males and 43% were females. Males are 1.3 time more prone for recurrent FS than females. In the study of Yusra Fayyadh Alwan et.al [29], they signified that 70.6% of male children had recurrent FS (p= 0.009). In a study by Jyoti Agrawal et.al [118] shown that 83% of children with recurrent FS were males and 17 % were females (p = 0.088). In the study of Ausi Indriani et,al [116], among children with recurrent FS, 72 % were males and 28 % were females. In contrast, the study of Anil Raj Ojha et.al [120] found that 54% of female children had experienced recurrent FS. But, there was not a statistical

significance (p =0.584). Hence, male gender is one of the most significant risk factor for recurrence of FS.

Duration of fever:

In this study , 73.9 % of children with recurrence had seizure within 24 hours of fever and rest of them (26.1%) , after 24 hours. Similar results were obtained in the following studies; In the study of Berg AT et.al [121] , they had enlightened that 67% of children had recurrent FS within 24 hours of fever and 13% , after 24 hours (p < 0.001). In a study by Nadirah rasyid ridha et.al [117] , revealed that the children having FS within 12 hours of fever were 4.96 times more prone for developing recurrent FS Ausi Indriani et.al [116] found that 46 % of children with recurrence had seizure within 24 hours of fever and 31 %, within 24 to 48 hours of fever in their study. Anil Raj Ojha et.al [120] , in their study, found that 60 % children had developed recurrent FS within 12 hours of fever (p =0.026. Hence, duration of fever less than 24 hours is a significant risk factor for FS recurrence.

Family history:

In this study , among children with recurrent FS, only 45.9% had positive family history (1˚ relative). But, In the meta analysis by Offringa et.al [32], 43% children with recurrent FS had positive family history (1˚ relative) and 32% ,

without family history. Berg et.al[121] found that 36% of children with positive family history had recurrence at one year and 20% , without family history. In another study by berg et.al [12] shown that patients with positive family history (1˚ relative) were 1.62 times more prone for having recurrent FS. Nadirah rasyid ridha et.al [117] , in their study, found that patients with positive family history of FS were 6 times more commonly affected with recurrence. In contrast to the above studies, Van stuijvenberg et.al [122] found that positive family history (1˚ relative) had a relative risk of 0.8 with recurrent FS. Ausi Indriani et.al [116], in their study revealed that family history were positive in only 28 % of patients with recurrent FS and negative in 57 % of patients. Hence, family history of febrile seizure does not affect the risk of recurrence of febrile seizure.

Anemia:

In the present study, shown that 59.2 % of children with FS had anemia (Hb < 11 g / dl). Similarly, in a study by Mashaer Abidlqader et. Al [128], found that 62.7 % children with febrile seizure had anemia. Mean Hb was 9.98 ± 1.85 in cases and in controls, 11.14 ± 1.81 (OR 3.26, RR 1.4). Among children with recurrent FS, 57.7% had anemia and 42.3 % had normal hemoglobin level (≥ 11 g / dl). But, it may not be a significant risk factor for recurrent febrile seizure statistically (p = 0.6).

Serum sodium:

Among the children with recurrent FS in the present study, only 27 % had serum sodium level less than 135 meq / L (p = 0.2). In contrast, in the study by M. Kulandhaivel et. al [(129)] , revealed that, among children with recurrent febrile seizures, the mean sodium (Na^+) level was 132.50 meq / L (p = 0.0025. Hence, low serum sodium level may not be a significant risk factor for development of recurrent febrile seizure.

LIMITATIONS TO THIS STUDY:

- The main limitation to this study was that it was a single hospital based study. Hence, multicentric and community based studies are needed to generalize the results in general population.

- Some records of the patients did not have the age at the first FS occurred, height of temperature during FS, duration of fever prior to seizure, type of febrile seizure and family history of FS, though they were crucial to conclude the risk of recurrent FS.

CONCLUSION:

We have studied 223 children having diagnosed as febrile seizure among 5239 children admitted in our hospital during the one year of study period.

- The prevalence of febrile seizure among admission was 4.25 % .
- Most of the children (82.1 %) were aged more than one year.
- Male children were more commonly affected than females. M : F = 1.9 : 1.
- Many of the children (81.2%) had developed febrile seizure within 24 hours of fever.
- Simple febrile seizure (90.1%) was the most common type of febrile seizure.
- Many children (71. 7%) had experienced seizure for less than 5 minutes.
- Most of the children (59.2%) had anemia (Hb < 11 g / dl).
- Among 223 children, 111 children (49.8%) had experienced recurrent febrile seizure.

In recurrent febrile seizures,

- Most of the children (73%) had their first febrile seizure before their first birth day.
- Male children (74.8%) are more commonly affected with recurrence.
- Many children (73.9 %) had recurrence within 24 hours of fever.

- Most of the children (57.7%) had affected more than one episode of recurrence.
- Many children (54.1%) did not have significant family history of febrile seizure.
- 57.7% children had anemia (Hb < 11 g / dl).
- 27% of children only had low serum sodium level (Na^+ < 135 meq / L).

Hence, in this study, age less than 1 year at first febrile seizure, male gender, duration of fever less than 24 hour prior to seizure were the most significant risk factors for recurrence of febrile seizure in our area. Family history of febrile seizure in first degree relative, anemia, low serum sodium level were not associated with recurrent febrile seizure.

So, we must follow up the children with these risk factors for recurrent febrile seizure and also educate the parents and care givers regarding the management of the febrile seizures at their home in an emergency situation.

We should create awareness to the parents about that the children having the above mentioned risk factors would have a chance of recurrent FS in the future.

We should prescribe cautiously for long term prophylaxis because of benign nature of febrile seizure and should mind the adverse effects of antiepileptic drugs for longer duration.

FUTURE IMPLICATIONS:

- For more accuracy, further studies are needed with primary data.
- Analytical studies are also needed to determine the risk factors for febrile seizure recurrence.
- Future studies are needed to specialize what preventive measures to be taken before the recurrence of febrile seizure.

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PROFORMA

Name
Age

Sex

Informant

Presenting complaints:

1.Fever 2.Seizures 3.Fever+Seizures 4.Any Other

Fever:

Duration: 1. <24 hrs 2. >24hrs

Seizures:

Duration(minutes) :

1. < 1 2. 1-5 3. 6-10 4. 11-15 5. >15

Type :

1.Generalised 2. Focal

Number of episodes:

Past history

Previous febrile seizure : yes no

If yes total number :

Developmental history

Normal Delay

Family history

Febrile Convulsion: Yes No

If yes 1.Sibling 2. Parent

3.Cousin 4. Distant Relative

Consanguinity

Clinical examination

AVPU

Pallor

Icterus

Cyanosis

Pedal oedema

Neurocutaneous markers

Vitals

PR- BP- RR- TEMP-

Anthropometry

Height : Weight: HC:

Systemic examination:

CVS RS

ABD CNS

Investigations

Complete blood count

RBS

RFT

Serum electrolytes

serum calcium

EEG

Neuroimaging

LP

S.No	Name	Age		Sex		Fever		Duration of fever		Type of Febrile seizure		Duration of Seizure		Past H/O FS		Age at first FS		Past FS number		Family H/O FS		Famil H/O Epilepsy		Develop mental delay		Hb (gm/dl)		Na+ (mEq/L)	
		<1yr	>1yr	M	F	<102.2°F	>102.2°F	<24 hr	>24hr	Simple	Complex	<5min	>5min	yes	No	<1 yr	>1 yr	1	>1	Yes	No	Yes	No	Yes	No	<11	>11	<135	135-145
z	Naveena		✓		✓	✓		✓		✓			✓		✓					✓			✓		✓		✓		✓
2	Lakshmi		✓		✓	✓			✓	✓			✓	✓		✓		✓		✓			✓		✓	✓			✓
3	Sarvin		✓	✓		✓		✓		✓		✓			✓						✓		✓		✓	✓			✓
4	Kadhir		✓	✓		✓			✓		✓		✓	✓		✓			✓	✓			✓		✓	✓		✓	
5	Subasri		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓	✓	
6	Rithigasri		✓		✓	✓		✓		✓			✓	✓			✓	✓			✓		✓		✓	✓			✓
7	Thigasshasri		✓		✓		✓	✓		✓		✓			✓					✓			✓		✓		✓		✓
8	Vanishri		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓		✓
9	Harish		✓	✓		✓			✓	✓			✓	✓		✓			✓		✓		✓		✓		✓		✓
10	Mithran		✓	✓		✓		✓		✓			✓	✓			✓		✓		✓		✓		✓	✓			✓
11	Thiyashree		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓	✓	
12	Deepikashree		✓		✓		✓	✓		✓		✓			✓					✓			✓		✓	✓			✓
13	Harish		✓	✓		✓		✓		✓		✓			✓						✓		✓		✓		✓		✓
14	Heman joy		✓	✓		✓			✓	✓		✓		✓		✓			✓	✓			✓		✓		✓		✓
15	kavitha		✓		✓	✓		✓		✓		✓		✓			✓	✓		✓			✓		✓	✓			✓
16	Harisumitha		✓		✓	✓		✓		✓		✓		✓		✓			✓	✓			✓		✓	✓			✓
17	Harish		✓	✓		✓		✓		✓		✓		✓		✓		✓		✓			✓		✓	✓			✓
18	Athithyan		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓		✓		✓	✓			✓
19	Ashwin		✓	✓		✓		✓		✓		✓		✓			✓	✓			✓		✓		✓		✓		✓
20	Janani		✓		✓	✓			✓	✓		✓		✓		✓		✓			✓		✓		✓	✓			✓
21	samuel raja		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
22	sashmitha		✓	✓		✓		✓			✓	✓			✓			✓			✓		✓		✓		✓	✓	
23	kavin kumar		✓	✓		✓		✓		✓		✓			✓			✓		✓			✓		✓		✓		✓
24	navin kumar	✓		✓		✓		✓			✓	✓			✓			✓			✓		✓		✓	✓			✓
25	rathish		✓	✓		✓		✓		✓			✓		✓			✓			✓		✓		✓	✓			✓
26	rithish		✓	✓		✓			✓	✓			✓	✓		✓			✓	✓			✓		✓		✓		✓
27	abimanu	✓		✓		✓		✓			✓	✓			✓			✓			✓		✓		✓		✓		✓
28	Kavinesh		✓	✓		✓		✓		✓		✓		✓			✓	✓			✓		✓		✓		✓		✓
29	dhayaram		✓	✓		✓			✓	✓			✓		✓			✓		✓			✓		✓	✓		✓	
30	hamanth		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓		✓		✓
31	karthic		✓	✓		✓		✓		✓			✓		✓			✓			✓		✓		✓		✓		✓

32	pranith yaswanth		✓	✓		✓		✓			✓	✓		✓		✓			✓		✓		✓		✓	✓			✓
33	sundhara mahalir	✓		✓		✓		✓		✓		✓			✓				✓		✓		✓		✓	✓		✓	
34	narmadha		✓		✓	✓		✓		✓		✓			✓			✓		✓			✓		✓	✓			✓
35	riyan		✓	✓		✓		✓		✓			✓		✓			✓		✓			✓		✓		✓		✓
36	yogasri		✓		✓	✓		✓			✓	✓			✓			✓			✓		✓		✓	✓			✓
37	kishore		✓	✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓		✓	✓	
38	kabisha	✓			✓			✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
39	sathya		✓		✓	✓			✓	✓		✓			✓			✓		✓			✓		✓	✓			✓
40	ilakkia		✓		✓		✓	✓		✓			✓		✓			✓			✓		✓		✓		✓	✓	
41	nithorsa		✓		✓	✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
42	bosspanoli	✓		✓		✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
43	rohith		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
44	harish		✓	✓		✓		✓		✓			✓	✓		✓			✓	✓			✓		✓		✓		✓
45	nandhakumar		✓	✓		✓			✓	✓			✓	✓		✓			✓		✓		✓		✓	✓			✓
46	buvonisha		✓		✓	✓		✓		✓		✓			✓			✓			✓		✓		✓	✓		✓	
47	yogesh		✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓		✓
48	sanjana		✓		✓	✓			✓	✓		✓		✓		✓			✓	✓			✓		✓	✓			✓
49	krishnapriyan	✓		✓		✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
50	nishanth	✓		✓		✓		✓		✓		✓		✓		✓			✓	✓			✓		✓	✓			✓
51	parvisha	✓			✓	✓		✓		✓		✓			✓						✓		✓		✓	✓			✓
52	nithish		✓	✓		✓			✓	✓		✓		✓		✓			✓	✓			✓		✓		✓	✓	
53	subhashini	✓			✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓	✓		✓	
54	dharshan		✓	✓		✓		✓		✓		✓		✓		✓				✓			✓		✓		✓		✓
55	Emisow		✓		✓	✓			✓	✓		✓			✓						✓		✓		✓	✓			✓
56	prajith		✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓	✓	
57	pranav vikram		✓	✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓	✓			✓
58	Mathesh ragavan		✓	✓		✓			✓	✓		✓		✓		✓		✓			✓		✓		✓		✓		✓
59	Sibimaran	✓		✓		✓		✓		✓		✓			✓						✓		✓		✓	✓			✓
60	Kumaresan		✓	✓		✓		✓		✓			✓	✓		✓		✓			✓		✓		✓		✓		✓
61	gugan		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓		✓		✓	✓		✓	
62	Murugapandi	✓		✓		✓		✓		✓			✓		✓						✓		✓		✓	✓		✓	
63	Harshiya		✓	✓		✓			✓	✓		✓		✓		✓			✓		✓		✓		✓	✓		✓	
64	Vikram prabhu		✓	✓		✓		✓		✓		✓		✓			✓	✓			✓		✓		✓	✓		✓	
65	hasini	✓			✓	✓			✓	✓		✓		✓		✓		✓			✓		✓		✓	✓		✓	
66	sadhana		✓		✓	✓		✓		✓			✓		✓					✓			✓		✓		✓		✓
67	janani		✓		✓	✓		✓		✓			✓	✓		✓		✓		✓			✓		✓		✓		✓
68	karthik daniel		✓	✓		✓		✓		✓		✓			✓						✓		✓		✓	✓			✓
69	madhan kumar		✓	✓		✓		✓			✓		✓	✓		✓			✓	✓			✓		✓	✓		✓	

70	pandeeswari		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓	✓	
71	hagira		✓		✓	✓		✓		✓		✓		✓			✓		✓	✓			✓		✓	✓			✓
72	yogesan		✓	✓		✓			✓	✓		✓		✓		✓		✓			✓				✓		✓	✓			✓
73	vishnu		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓				✓		✓	✓			✓
74	sridhar		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓				✓		✓		✓		✓
75	jeya prabha		✓		✓	✓			✓	✓		✓		✓			✓	✓		✓					✓		✓	✓			✓
76	amal		✓	✓		✓		✓		✓			✓		✓			✓			✓				✓		✓		✓		✓
77	gobi		✓	✓		✓		✓			✓	✓		✓		✓			✓	✓					✓		✓	✓			✓
78	pavithran	✓		✓		✓		✓		✓		✓			✓					✓		✓			✓		✓	✓		✓	
79	yazhini		✓		✓	✓			✓	✓		✓			✓			✓		✓					✓		✓		✓		✓
80	amalesh		✓	✓		✓		✓		✓			✓		✓			✓		✓					✓		✓		✓		✓
81	maheswari		✓		✓	✓		✓		✓		✓			✓			✓			✓				✓		✓	✓			✓
82	mithran		✓	✓		✓			✓	✓		✓		✓		✓			✓		✓				✓		✓	✓			✓
83	sowmiya		✓		✓	✓		✓		✓		✓		✓		✓			✓	✓					✓		✓	✓			✓
84	kavi	✓		✓		✓		✓		✓		✓			✓			✓		✓					✓		✓	✓			✓
85	mukesh	✓		✓		✓		✓		✓		✓		✓		✓			✓	✓					✓		✓	✓			✓
86	gowthaman		✓	✓		✓			✓	✓		✓		✓			✓	✓			✓				✓		✓	✓		✓	
87	thanu sri		✓		✓	✓		✓		✓		✓		✓		✓			✓	✓					✓		✓		✓		✓
88	devarakshan	✓		✓		✓		✓		✓		✓			✓			✓		✓					✓		✓	✓			✓
89	velmani	✓		✓		✓		✓		✓		✓		✓		✓			✓	✓					✓		✓	✓			✓
90	shravan		✓	✓		✓		✓		✓		✓			✓						✓		✓		✓		✓		✓
91	manivelsamy		✓	✓		✓		✓			✓		✓	✓			✓		✓	✓			✓		✓	✓		✓		
92	praghiya		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓	✓		
93	shanthan		✓	✓		✓		✓		✓		✓			✓					✓			✓		✓	✓			✓
94	acthayan		✓	✓		✓			✓	✓		✓		✓		✓			✓	✓			✓		✓	✓			✓
95	mahalakshmi		✓		✓	✓		✓		✓		✓		✓			✓	✓		✓			✓		✓	✓			✓
96	ashwin	✓		✓		✓		✓		✓			✓		✓					✓			✓		✓	✓		✓	
97	manish		✓	✓		✓			✓	✓		✓		✓		✓			✓		✓		✓		✓	✓		✓	
98	suriya kumar		✓	✓		✓		✓		✓		✓		✓			✓	✓		✓			✓		✓	✓		✓	
99	venkateshwari	✓			✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓	✓	
100	deepika		✓		✓	✓		✓		✓			✓	✓		✓		✓			✓		✓		✓	✓			✓
101	thiyagarani		✓		✓	✓		✓		✓		✓			✓					✓			✓		✓		✓		✓
102	surekha		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓	✓			✓
103	kamarajan		✓	✓		✓			✓	✓			✓	✓		✓			✓	✓			✓		✓		✓		✓
104	sheik mohammed		✓	✓		✓		✓		✓			✓	✓		✓			✓		✓		✓		✓	✓			✓
105	karthikeyan		✓	✓		✓		✓		✓		✓			✓			✓		✓			✓		✓	✓		✓	
106	thiruvengadam		✓	✓		✓		✓			✓	✓			✓			✓			✓		✓		✓		✓		✓
107	sibi		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓		✓		✓

108	manikandan	✓		✓		✓		✓			✓	✓			✓			✓		✓			✓		✓			✓		✓
109	dinesh		✓	✓		✓		✓		✓			✓		✓			✓			✓		✓		✓			✓		✓
110	sopnajothi		✓		✓	✓		✓			✓	✓			✓			✓			✓		✓		✓			✓		✓
111	kishore		✓	✓		✓			✓	✓		✓		✓		✓			✓		✓		✓		✓			✓	✓	
112	priyanka	✓			✓			✓		✓		✓			✓			✓		✓			✓		✓			✓		✓
113	syed ali fathima		✓		✓	✓			✓	✓		✓			✓			✓			✓		✓		✓			✓		✓
114	sri nandhini		✓		✓	✓		✓		✓			✓		✓			✓		✓			✓		✓			✓	✓	
115	gayathri	✓			✓	✓		✓		✓		✓			✓						✓		✓		✓			✓		✓
116	promoth		✓	✓		✓		✓		✓		✓		✓		✓			✓	✓			✓		✓		✓	✓		
117	keerthana	✓			✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓	✓			✓	
118	foumithan		✓	✓		✓		✓		✓		✓		✓		✓				✓			✓		✓	✓			✓	
119	ajitha		✓		✓	✓		✓		✓		✓			✓						✓		✓		✓	✓			✓	
120	sushmitha		✓		✓	✓		✓		✓			✓		✓					✓			✓		✓		✓		✓	
121	sara		✓		✓	✓		✓		✓			✓	✓		✓		✓		✓			✓		✓		✓		✓	
122	alagar raj		✓	✓		✓		✓		✓		✓			✓						✓		✓		✓	✓			✓	
123	gokulakrishnan		✓	✓		✓		✓			✓		✓	✓		✓			✓	✓			✓		✓	✓		✓		
124	rithika		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓	✓		
125	mathy		✓		✓	✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓	
126	rohith kumar		✓	✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓		✓		✓	
127	jastar sadha		✓		✓	✓		✓		✓		✓		✓			✓		✓	✓			✓		✓		✓		✓	
128	dhaya	✓		✓		✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓	
129	dev josh	✓		✓		✓		✓		✓		✓		✓		✓			✓	✓			✓		✓	✓			✓	
130	bagavathi		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓	✓		
131	tharuna		✓		✓	✓			✓	✓		✓			✓					✓			✓		✓	✓			✓	
132	logajith		✓	✓		✓		✓		✓		✓			✓						✓		✓		✓	✓			✓	
133	hem nath		✓	✓		✓		✓		✓		✓		✓			✓		✓	✓			✓		✓		✓		✓	
134	dhiya		✓		✓	✓		✓		✓		✓		✓			✓	✓		✓			✓		✓	✓			✓	
135	tharun		✓	✓		✓		✓		✓			✓	✓		✓			✓		✓		✓		✓		✓		✓	
136	abishek	✓		✓		✓		✓			✓	✓			✓			✓		✓			✓		✓		✓		✓	
137	subash		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓		✓		✓	✓			✓	
138	chandru		✓	✓		✓			✓	✓			✓		✓			✓		✓			✓		✓	✓			✓	
139	manoj		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓		✓		✓	
140	chitra		✓		✓	✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓	
141	nithyan	✓		✓		✓			✓	✓		✓			✓			✓		✓			✓		✓	✓		✓		
142	ramesh		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓	
143	babu		✓	✓		✓		✓		✓			✓	✓		✓			✓	✓			✓		✓		✓		✓	
144	govindh		✓	✓		✓			✓	✓			✓	✓		✓			✓		✓		✓		✓	✓			✓	
145	jeshwanth		✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓	✓		

146	prem kumar		✓	✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓	✓			✓
147	arasan		✓	✓		✓			✓	✓		✓		✓		✓		✓		✓			✓		✓			✓		✓
148	chithambaram	✓		✓		✓		✓		✓		✓			✓					✓			✓		✓	✓			✓
149	priyadharshan		✓	✓		✓		✓		✓			✓	✓		✓		✓			✓		✓		✓		✓		✓
150	sivapriyan		✓	✓		✓		✓		✓		✓		✓				✓		✓	✓			✓		✓		✓	✓	
151	mannan		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓		✓		✓	✓			✓
152	nagaraj		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓
153	sandhiya		✓		✓	✓		✓		✓		✓		✓			✓	✓			✓		✓		✓	✓			✓
154	yuvaraj		✓	✓		✓		✓		✓		✓			✓			✓		✓			✓		✓	✓			✓
155	bharath		✓	✓		✓		✓			✓	✓			✓			✓			✓		✓		✓		✓		✓
156	sivaranjan		✓	✓		✓		✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓
157	vinoth		✓	✓		✓			✓	✓			✓		✓			✓			✓		✓		✓	✓			✓
158	bazith		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓		✓		✓
159	sundaramoorthy		✓	✓		✓		✓		✓			✓		✓			✓		✓			✓		✓		✓		✓
160	sridhar		✓	✓		✓		✓			✓	✓		✓			✓		✓		✓		✓		✓	✓			✓
161	nithya sri	✓			✓			✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
162	anu		✓		✓	✓			✓	✓		✓			✓			✓		✓			✓		✓		✓		✓
163	krithika		✓		✓	✓		✓		✓			✓		✓			✓			✓		✓		✓	✓		✓	
164	soundharya		✓		✓	✓		✓		✓		✓			✓			✓		✓			✓		✓	✓			✓
165	aravindh	✓		✓		✓			✓	✓		✓			✓			✓			✓		✓		✓	✓			✓
166	varsha		✓		✓	✓		✓		✓		✓		✓		✓			✓	✓			✓		✓		✓		✓
167	tharanitharan	✓		✓		✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
168	sidharth	✓		✓		✓		✓		✓		✓		✓			✓		✓	✓			✓		✓	✓			✓
169	uma	✓			✓	✓		✓		✓		✓			✓						✓		✓		✓	✓			✓
170	anandh		✓	✓		✓		✓		✓		✓		✓		✓			✓	✓			✓		✓		✓	✓	
171	mani		✓	✓		✓			✓	✓		✓		✓		✓		✓			✓		✓		✓		✓		✓
172	bharath	✓		✓		✓			✓	✓		✓			✓						✓		✓		✓	✓			✓
173	siva		✓	✓		✓		✓		✓			✓	✓			✓	✓			✓		✓		✓		✓		✓
174	guna		✓	✓		✓		✓		✓		✓		✓		✓		✓		✓			✓		✓	✓		✓	
175	kesavan	✓		✓		✓		✓		✓			✓		✓					✓			✓		✓	✓		✓	
176	shanmugam		✓	✓		✓		✓		✓		✓			✓						✓		✓		✓	✓			✓
177	gowtham		✓	✓		✓		✓			✓		✓	✓		✓			✓	✓			✓		✓	✓		✓	
178	shaswanthini		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓	✓	
179	renganayagi		✓		✓	✓		✓		✓			✓	✓			✓	✓		✓			✓		✓	✓			✓
180	aruna		✓		✓	✓		✓		✓		✓			✓						✓		✓		✓		✓		✓
181	sri siva shankar		✓	✓		✓		✓		✓		✓			✓					✓			✓		✓	✓			✓
182	vikram kumar		✓	✓		✓			✓	✓		✓		✓		✓			✓	✓			✓		✓		✓		✓
183	mythili		✓		✓	✓		✓		✓		✓		✓			✓	✓		✓			✓		✓	✓			✓

184	bhuvaneshwari		✓		✓	✓		✓		✓		✓		✓		✓			✓	✓			✓		✓	✓			✓
185	mani		✓	✓		✓		✓		✓		✓		✓		✓		✓		✓			✓		✓	✓			✓
186	azarudhin		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓		✓		✓
187	kesavan	✓		✓		✓		✓			✓	✓			✓			✓		✓			✓		✓	✓			✓
188	manivannan		✓	✓		✓		✓		✓			✓		✓			✓			✓		✓		✓	✓			✓
189	ishwaryan		✓	✓		✓		✓		✓			✓	✓		✓			✓		✓		✓		✓		✓		✓
190	kogilan	✓		✓		✓		✓			✓	✓			✓			✓			✓		✓		✓		✓		✓
191	perumal	✓		✓		✓		✓		✓		✓			✓					✓	✓			✓		✓	✓		✓	
192	nandhini		✓		✓	✓			✓	✓		✓			✓			✓			✓			✓		✓	✓			✓
193	vadivel raj		✓	✓		✓		✓		✓			✓		✓			✓		✓			✓		✓		✓		✓
194	amutha		✓		✓	✓		✓			✓	✓			✓			✓			✓		✓		✓	✓			✓
195	kamesh		✓	✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓	✓		✓	
196	kavin		✓	✓		✓		✓		✓		✓			✓			✓		✓			✓		✓	✓			✓
197	siddhu		✓	✓		✓		✓		✓			✓	✓		✓			✓		✓		✓		✓		✓		✓
198	shami		✓	✓		✓			✓	✓			✓	✓		✓			✓		✓		✓		✓	✓			✓
199	lakshmi		✓		✓	✓		✓		✓		✓			✓			✓		✓			✓		✓	✓			✓
200	anbalagan		✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓		✓
201	suganthi	✓			✓	✓		✓		✓		✓		✓			✓	✓			✓		✓		✓	✓		✓	
202	tamil arasan		✓	✓		✓		✓		✓		✓		✓		✓				✓			✓		✓		✓		✓
203	eshwari		✓		✓	✓		✓		✓		✓			✓					✓			✓		✓	✓			✓
204	balakrishnan		✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓	✓	
205	durai		✓	✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓		✓
206	thulasi		✓		✓	✓		✓		✓			✓		✓					✓			✓		✓	✓			✓
207	arun prasanna		✓	✓		✓		✓		✓			✓	✓			✓		✓		✓		✓		✓		✓		✓
208	senthil		✓	✓		✓			✓	✓			✓	✓		✓			✓		✓		✓		✓		✓		✓
209	karthiga		✓		✓	✓		✓		✓			✓		✓						✓		✓		✓		✓		✓
210	padma		✓		✓	✓		✓		✓		✓			✓					✓			✓		✓	✓			✓
211	dhayananth		✓	✓		✓		✓		✓		✓		✓		✓		✓		✓			✓		✓	✓			✓
212	rajendran		✓	✓		✓			✓	✓		✓		✓		✓		✓			✓		✓		✓		✓		✓
213	nirmala		✓		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓		✓	✓			✓
214	kavin kumar		✓	✓		✓		✓		✓		✓			✓			✓			✓		✓		✓	✓			✓
215	lakshman		✓	✓		✓		✓			✓	✓			✓			✓			✓		✓		✓		✓	✓	
216	kavipriyan		✓	✓		✓		✓		✓		✓		✓		✓		✓			✓		✓		✓		✓		✓
217	preveen		✓	✓		✓		✓		✓			✓		✓			✓			✓		✓		✓	✓			✓
218	lawrance		✓	✓		✓		✓		✓		✓			✓			✓		✓			✓		✓		✓		✓
219	suburaj		✓	✓		✓		✓		✓			✓		✓			✓		✓			✓		✓		✓		✓
220	aarokiyasamy		✓	✓		✓		✓			✓	✓		✓			✓		✓		✓		✓		✓	✓			✓
221	kamlesh		✓	✓		✓			✓	✓		✓		✓		✓			✓		✓		✓		✓	✓		✓	

222	monoharan		✓	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	✓		✓	
223	kannagi	✓			✓	✓			✓	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	✓	